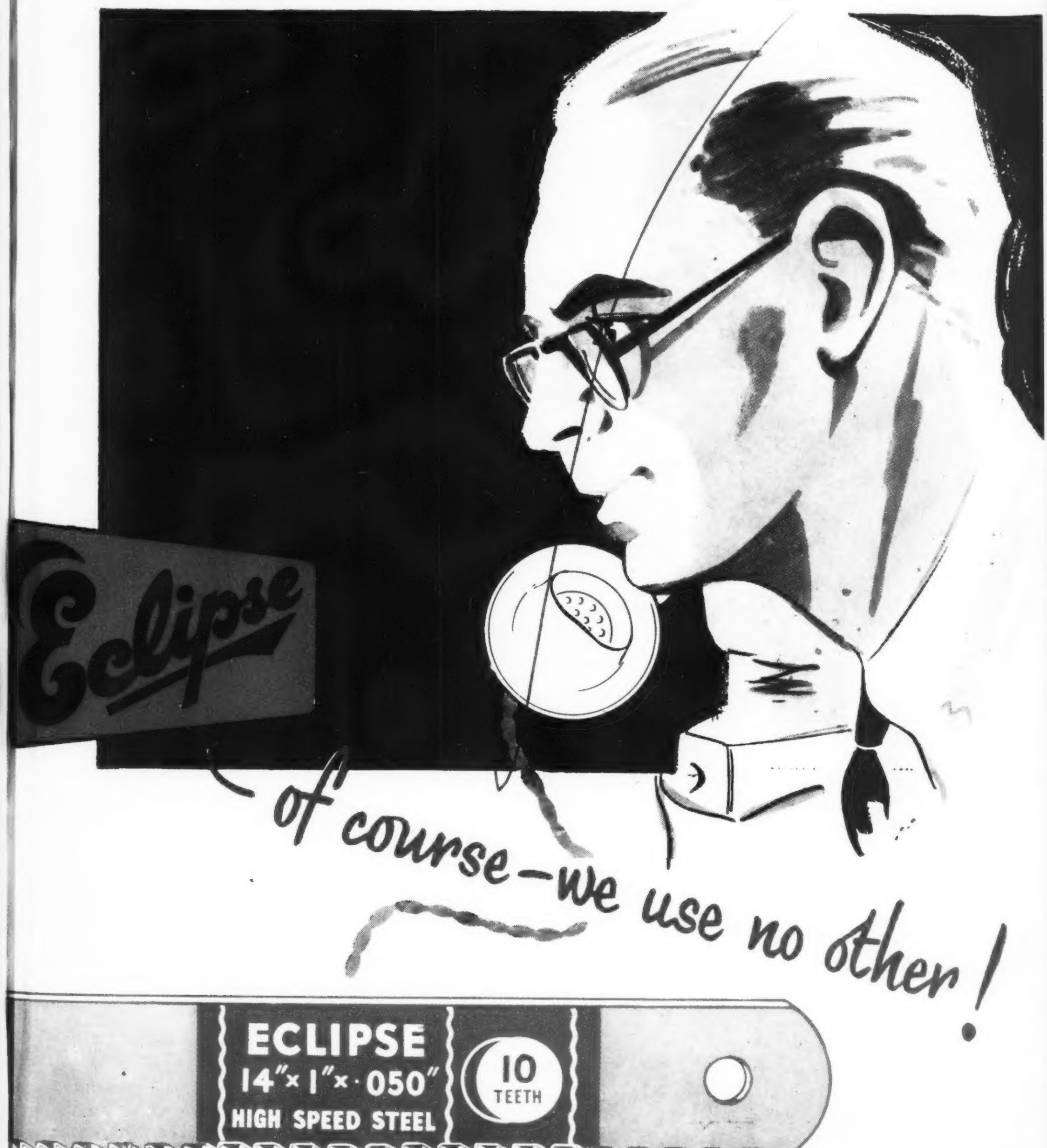
MACHINERY

AUGUST 16, 1961

ONE SHILLING & THREEPENCE



TS

the

and the
emand
now
es.
an be

ers

y other

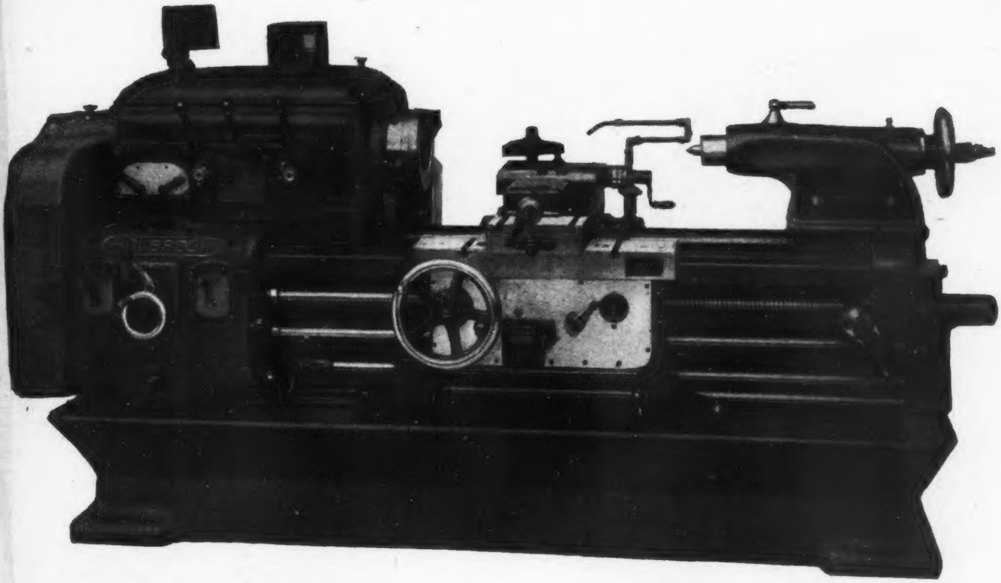
D

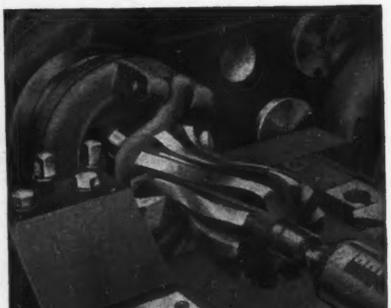
Augu

U

MODEL 'R'

UNIVERSAL RELIEVING LATHES





BUILT IN TWO SIZES, FOR RELIEVING AND GRINDING CUTTERS UP TO 4" AND 9" DIAMETER

FEATURES INCLUDE

PRECISION LEADSCREW WITH COMPENSATING END THRUST

VARIABLE RISE CAM

3 TO 1, QUICK RETURN OF CARRIAGE IN EITHER DIRECTION

REAR OPERATION, FOR LEFT HAND WORK

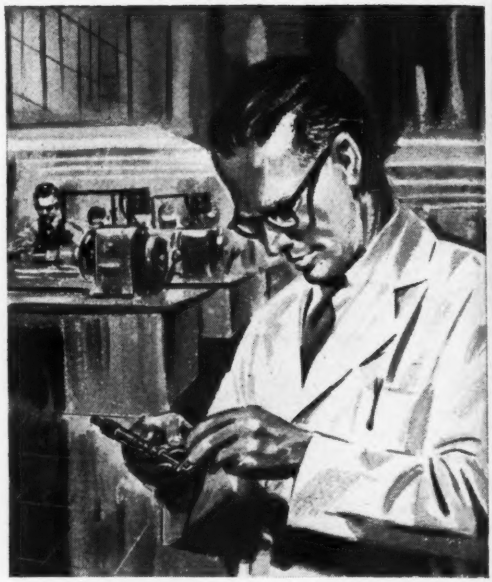
HOLBROOK MACHINE TOOL CO. LTD.

CAMBRIDGE ROAD, HARLOW, ESSEX


Your metal requirements
CAN BE SATISFIED BY
NETTLEFOLD & MOSER
WIDE RANGE
WITH A SPEEDY DELIVERY SERVICE
Our Stock range covers:
'Mills' Bright Steel: rounds, squares, hexagons, angles, flats.
'Mills' Ledloy Bright Freecutting to Spec. EN.I.A: rounds, squares, hexagons:
'Mills' Bright Super Non-Leaded Freecutting to Spec. EN.I.A: rounds, hexagons.
'Mills' Bright Steel to EN Specifications.
Aluminium Sheets.
Brass Bars & Flats.
Black Mild Steel: rounds, squares, flats, angles, channels, tees.
Steel Plates.
Sheets: Black: Cold Reduced General Purpose and Oiled, Hot Rolled Strip Mill, C.R.C.A.P.F.
Galvanised: "Galvatite", "Speltafast", C.R.C.A.P.F., Corrugated.
Nettlefold & Moser Limited are main stockholding agents for Exors of James Mills Limited (Bright Steels) and United Non-Ferrous Metals Co. Limited (Brass Bars & Flats).

K259

Brussels *Exhibition*—Kendall & Gent Plano-Milling and Face-Milling Cutter Grinding machines will be shown on Stand 5207 at the 7th European Machine Tool Exhibition, Sept. 3-12 1961



Weekends

this gardener produces some of the finest vegetables in his allotment society. Like many others with his experience, he swears by Spear & Jackson tools!

Weekdays

he's foreman of a toolroom with a reputation for producing tools that give consistent high performance—using Spear & Jackson tool steels of course!

For the same reasons that experienced gardeners and woodworkers place such confidence in Spear & Jackson tools, *you* can trust Spear & Jackson Tool Steels consistently to give you what you want. Telephone Mr. Steel at Sheffield 20202 and tell him what you *do* want!

SPEAR & JACKSON **TOOL STEELS TO TRUST**

Other products include: *Segmental Saws · Hot Saws · Friction Saws Hacksaws · Metal Cutting Bandsaws · Fusion Bends · Tungsten Carbide Tipped Saws and Cutters · Machine Knives · Ground Flat Stock*

OA/6840

AETNA WORKS, SAVILE STREET, SHEFFIELD Tel: 20202

g

A

yo

Tr

as

in

m

or

ar

Co
mo
bu
fin
ma
ma

ALS

M

FOR TOOLROOM AND PRODUCTION

NEW THIEL 117

Precision Bandsawing & Bandfiling Machine

SPEEDS INFINITELY VARIABLE · 50-3000 FT/MIN

20" THROAT

Other Principal THIEL *Features*

* 10" maximum work height
* 24" x 24" table swivels 30° to right and left, 15° to front and back
* Compact, clean design
* Special precision saw guides
* Rapid changeover from sawing to filing
* Butt welding unit and grinding wheel enclosed in machine body
* Original THIEL bandsaws and bandfiles now available.

EARLY DELIVERY

ROCKWELL
MACHINE TOOL CO. LTD

For further particulars write or telephone TODAY

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

ALSO AT BIRMINGHAM—TEL: SPRINGFIELD 1134/5 · STOCKPORT—TEL: STOCKPORT 5241 · GLASGOW—TEL: MERRYLEE 2822

Thiel 10

61

y

g
e

IN

es

right
k

ng to

nding
dy

and

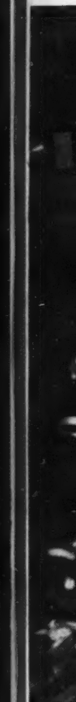
0033

2822

Aug

4
pre
plic

T



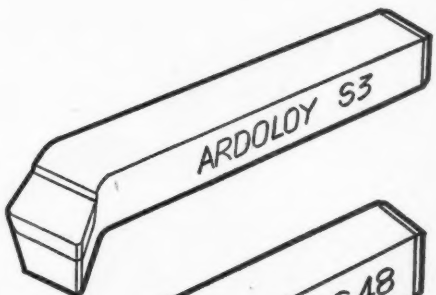
Ardol

Too
LAT
FAC
PRE
THR
TWI
Loos

A

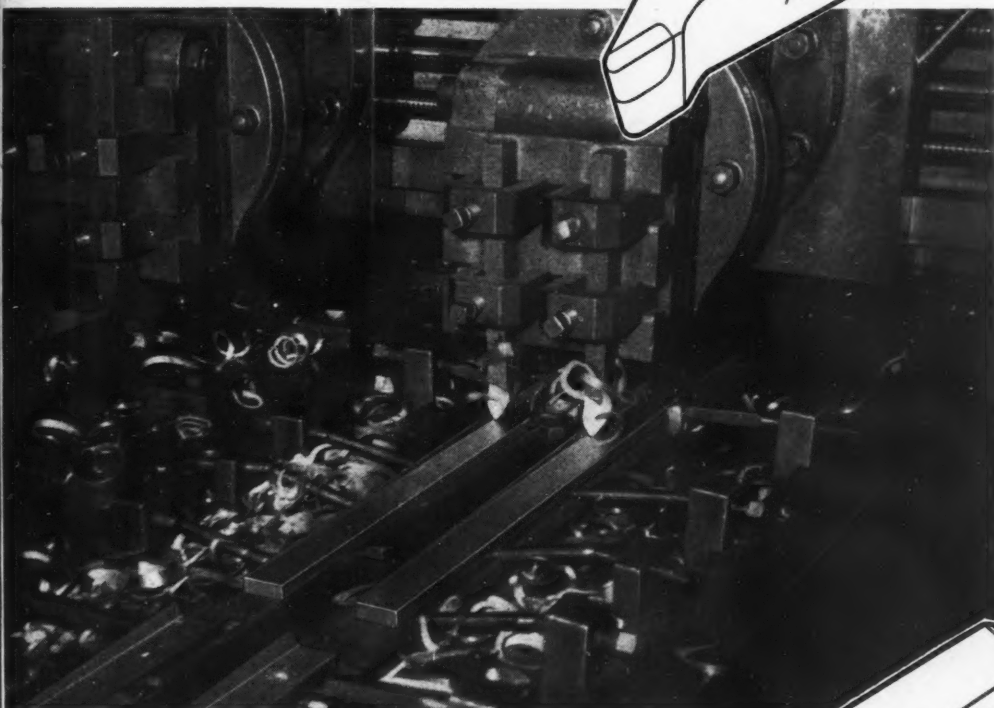
Ardoloy

An A.E.I. Product



Ardoloy-tipped tools can be supplied for all appropriate machining operations and for those applications where resistance to wear is important.

Ten grades—each for a specific class of work.



Ardoloy grade S 200 planing tools machining jib strips, surface speed 100 ft. per min., ⅜" depth of cut, feed ·025".

Tools include :—

LATHE and PLANER TOOLS
FACE and OTHER TYPES OF MILLING CUTTERS
PRECISION ADJUSTABLE BORING TOOLS
THREADING TOOLS
TWIST DRILLS, REAMERS and COUNTERBORING TOOLS

Loose tips supplied to enable customers to tip their own tools

ALFRED **HERBERT** LTD., COVENTRY

AH

AD 611

Of Course there is an *EASIER* way....

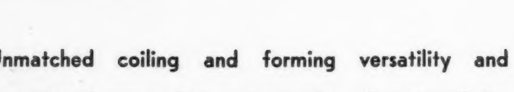
the CURVIT bending & coiling machine

Unmatched coiling and forming versatility and operational ease. Set-up is simple. Just install the correct rollers, adjust the radius feed, set the pitch and that is all. **One set of form rollers required for each size of stock, the same set being used to obtain any radius.** Models range in sizes to handle from $\frac{1}{8}$" up to 4" dia. stock for forming into circles, squares, triangles and many other shapes.

Machines readily automated to make constant or programmed adjustments without feed interruptions.

A wide range of machines for coiling and bending pipe, tube, flat stock and solid bars from $\frac{1}{8}$" up to 4" dia.

Write for complete information.



FUNDITOR LTD.

3, Woodbridge Street, London E.C.1
CLErkenwell 6155/7

GRAZIANO

SAG 180 *centre lathe*

- ★ **Bedways hardened and ground**
- ★ **Spindle fitted with gamet bearings**
- ★ **Cam-lock spindle nose**
- ★ **Swings 19½" in gap without removal of gap-block**
- ★ **Hardened and ground gears**

Swing over bed	**14"**
Swing in gap	**19½"**
Distance between centres ...	**40" - 60"**
Spindle speeds (9)	**45-1,500 or 54-1,800 r.p.m.**

PLEASE SEND FOR FULL DETAILS

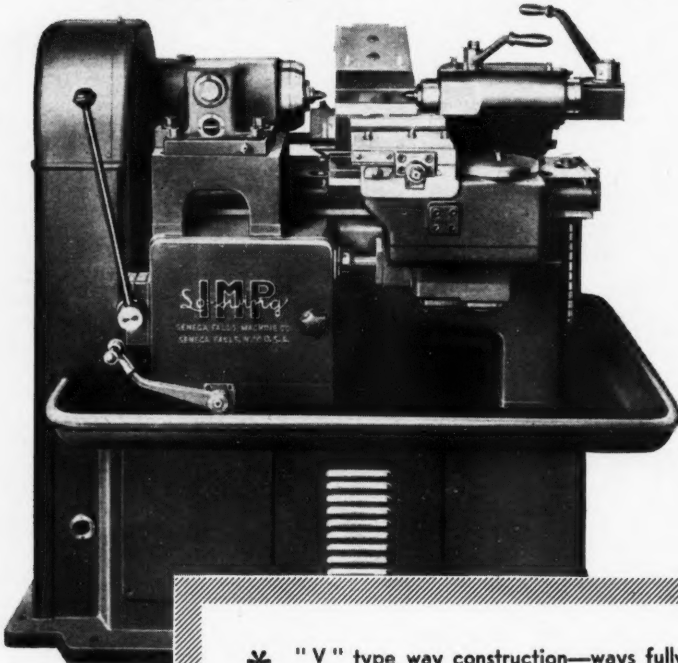
ELGAR MACHINE TOOL COMPANY LIMITED

172-178 VICTORIA ROAD · ACTON · LONDON W3 · Telephone ACORN 5555
MIDLANDS SHOWROOM: 1075 KINGSBURY ROAD, ERDINGTON, BIRMINGHAM 24. Tel: Castle Bromwich 3781/2
Sole Scottish Agents: Angus & Crichton (Sales) Ltd., 7 Midland Street, Glasgow C.1. Telephone: City 4560

NRP 3474

SENECA FALLS

Lo-swing IMP AUTOMATIC LATHE



✻ Check these fine features!

- ✻ "V" type way construction—ways fully protected.
- ✻ 5,000 r.p.m. spindle and belt driven headstock prevents vibration at high speeds. 5 h.p. motor drive.
- ✻ Rapid traverse rate and short set-up time.
- ✻ Dial set lost-motion mechanism and cam feed.
- ✻ Air operated clutch and brake on main drive motor.
- ✻ Third Slide can be furnished for additional facing, grooving and chamfering operations—roughing or finishing.

GASTON E. MARBAIX LTD.

Devonshire House, Vicarage Crescent, Battersea, S.W.11. **Phone: Battersea 8888 (8 lines)**

NRP 3597

1961

lines)

Au

Br

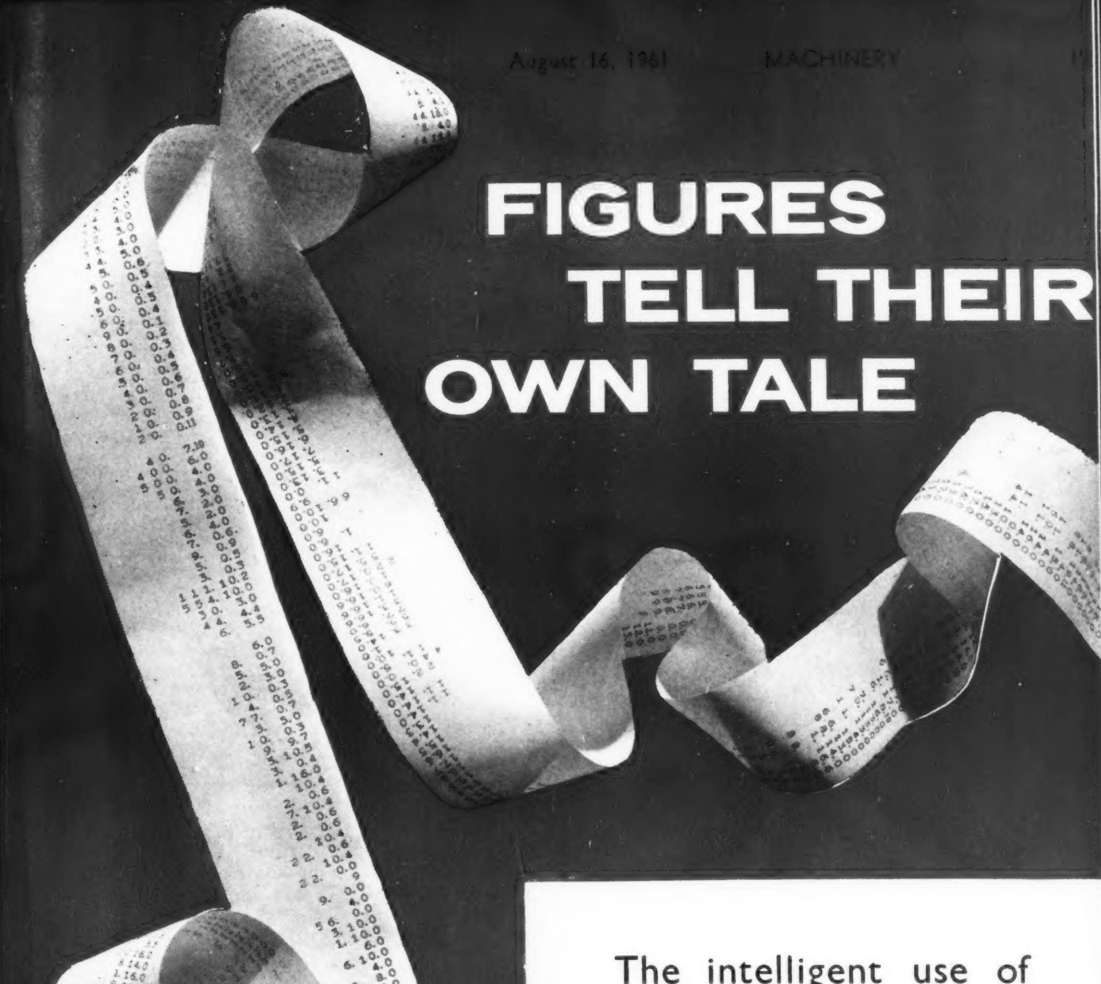
Ta
Ta
Di
He
Cr
Bo
Mi
Bo
Ma
Fa
Sp
Ra
Ma
W

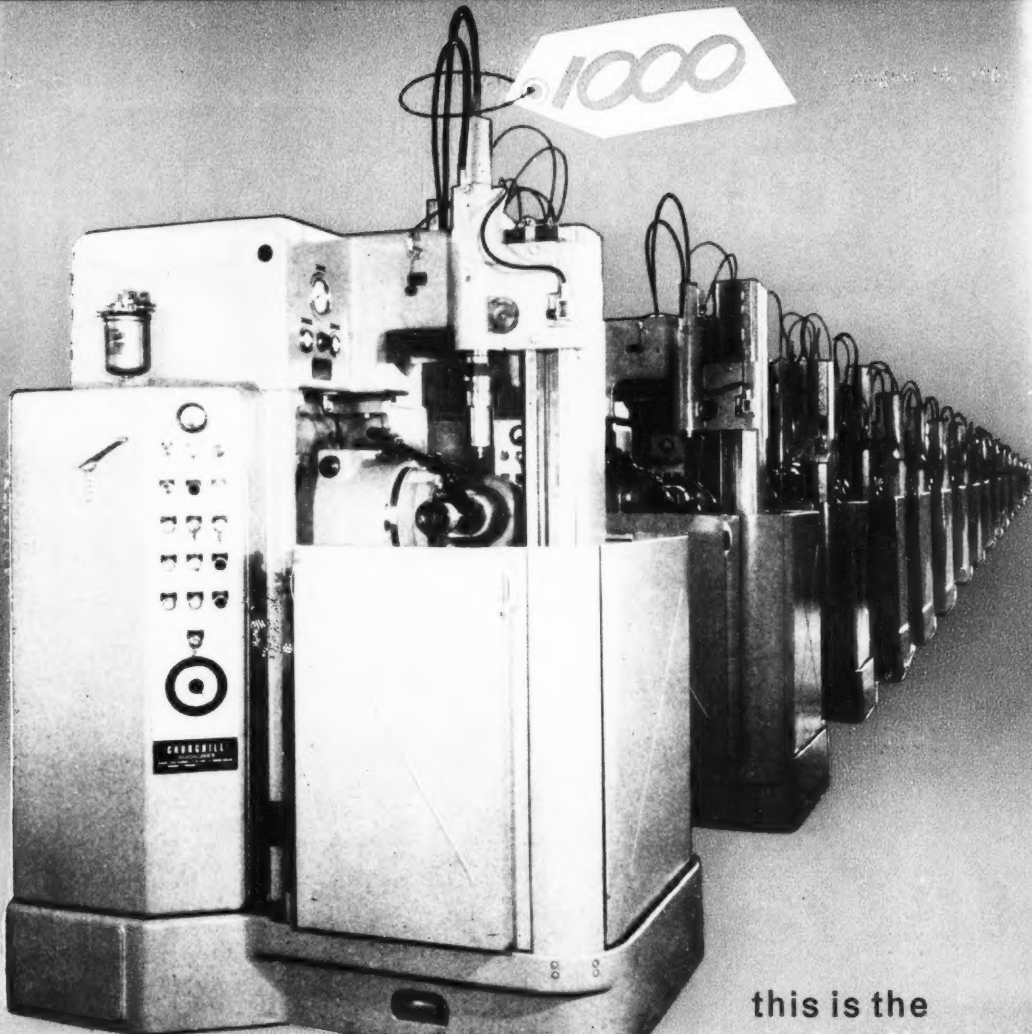
961

R

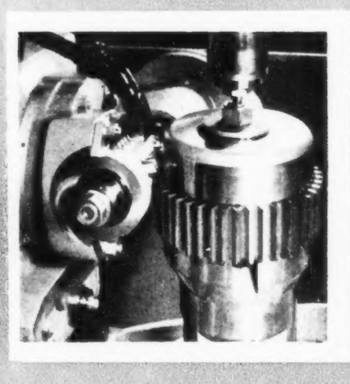
ER/
. . a
ight,
n be
netal
ning,
tone
ight
able
peed
d of
peed
o all,
nous
ITY.

3-127
SAS


FIGURES
TELL THEIR
OWN TALE
The intelligent use of
DYSON'S
LABORATORY CONTROLLED
PRESSURE DIE CASTINGS
can cut your production
costs
OUR TECHNICIANS WILL GLADLY TELL YOU HOW THE LATEST DEVELOPMENTS CAN BE APPLIED TO YOUR OWN PRODUCTS. GET IN TOUCH WITH US
APPROVED TO BRITISH STANDARD
DYSON & CO. ENFIELD (1919) LTD
SOUTHBURY WORKS, PONDERS END, MIDDLESEX



this is the
THOUSANDTH
Churchill Rigidhobber



Nine hundred and ninety nine others *in the field* prove the leadership of Churchill Rigidhobbers for gear production.

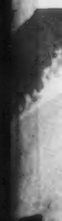
The technical reasons for the success of Churchill Rigidhobbers are fully explained in a new illustrated brochure—available to you, on request.

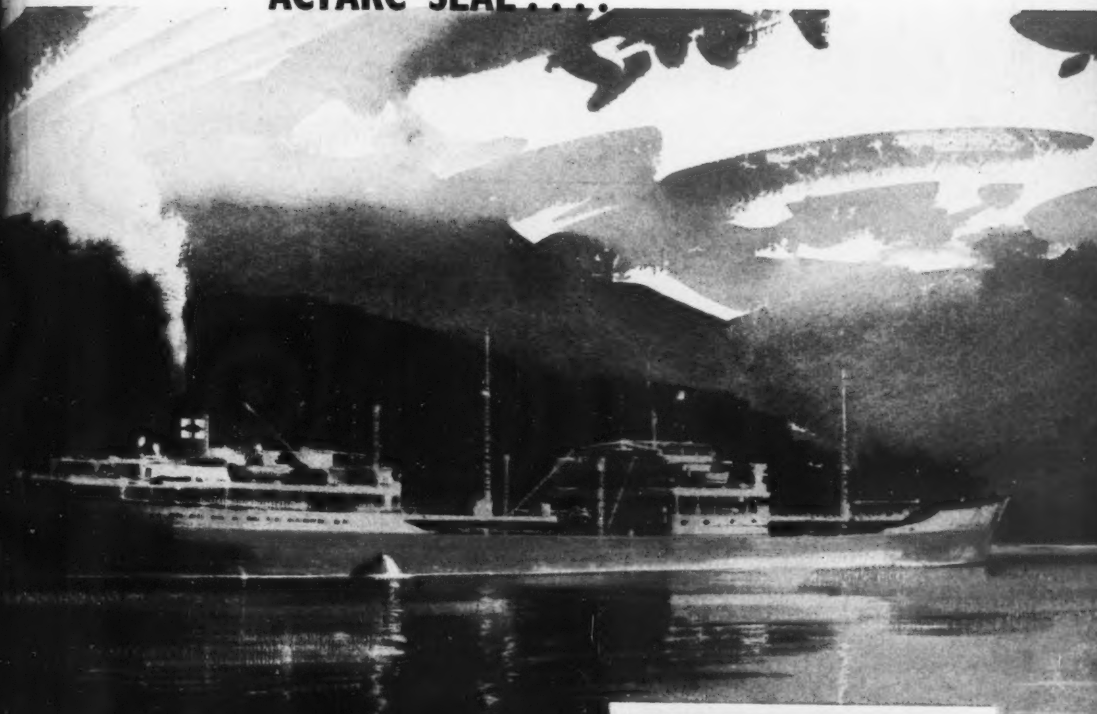
Manufacturers of Gear Hobbing Machines up to 36" capacity, Gear Shaving Machines up to 30" capacity, Hard Gear Finishing Machines. Gear Forming Machines. Gear Testing Machines. Gear Chamfering Machines. Gear Tooth Rounding Machines. Link-Line Equipment.

C gm

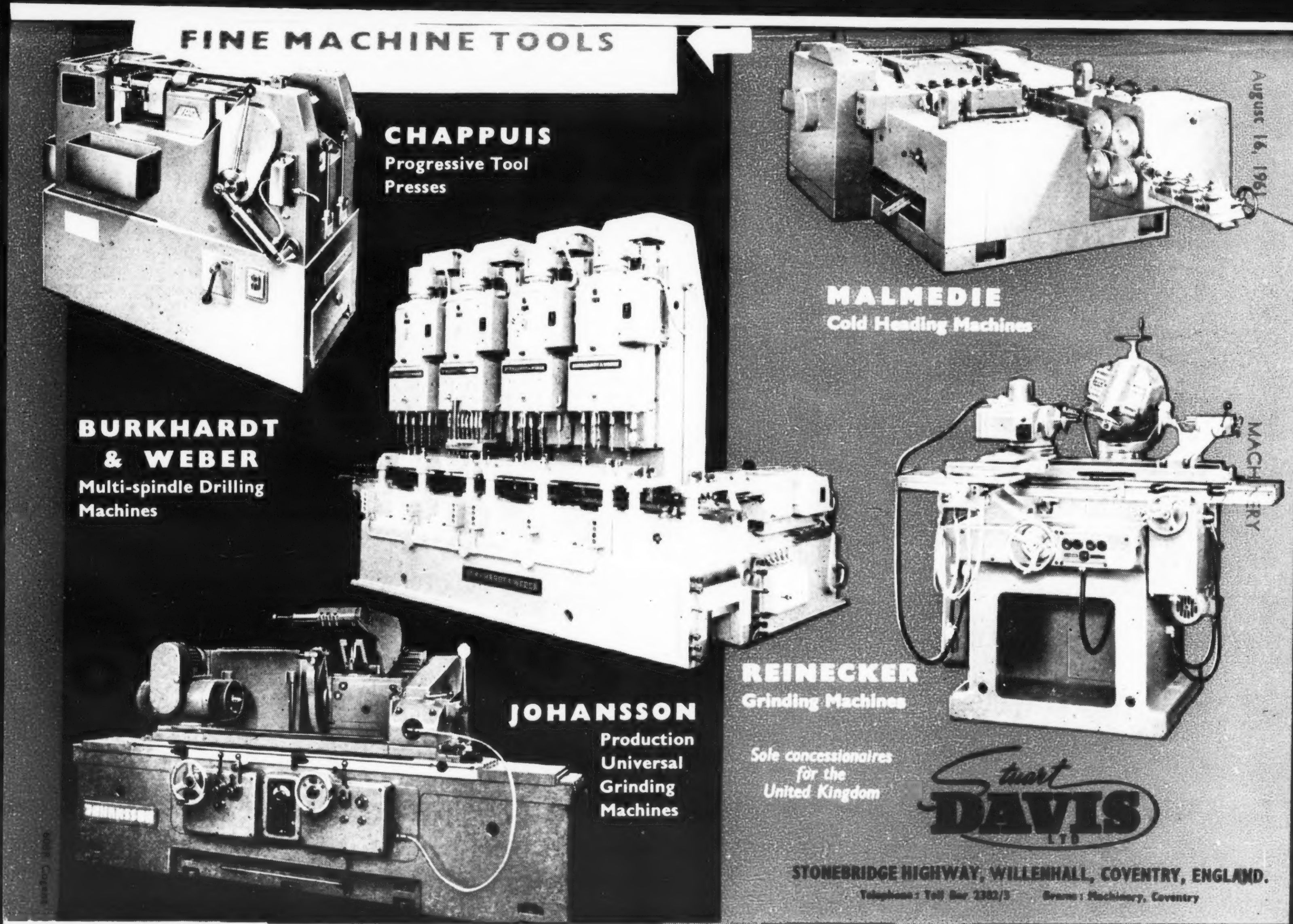
CHURCHILL GEAR MACHINES LTD
a Company of the Charles Churchill Group
Blaydon-on-Tyne · Co. Durham · England

Au

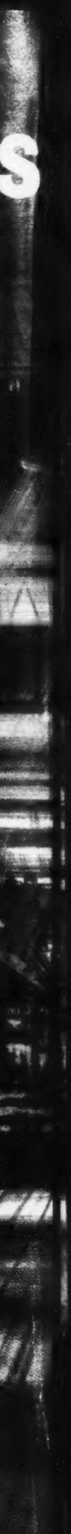




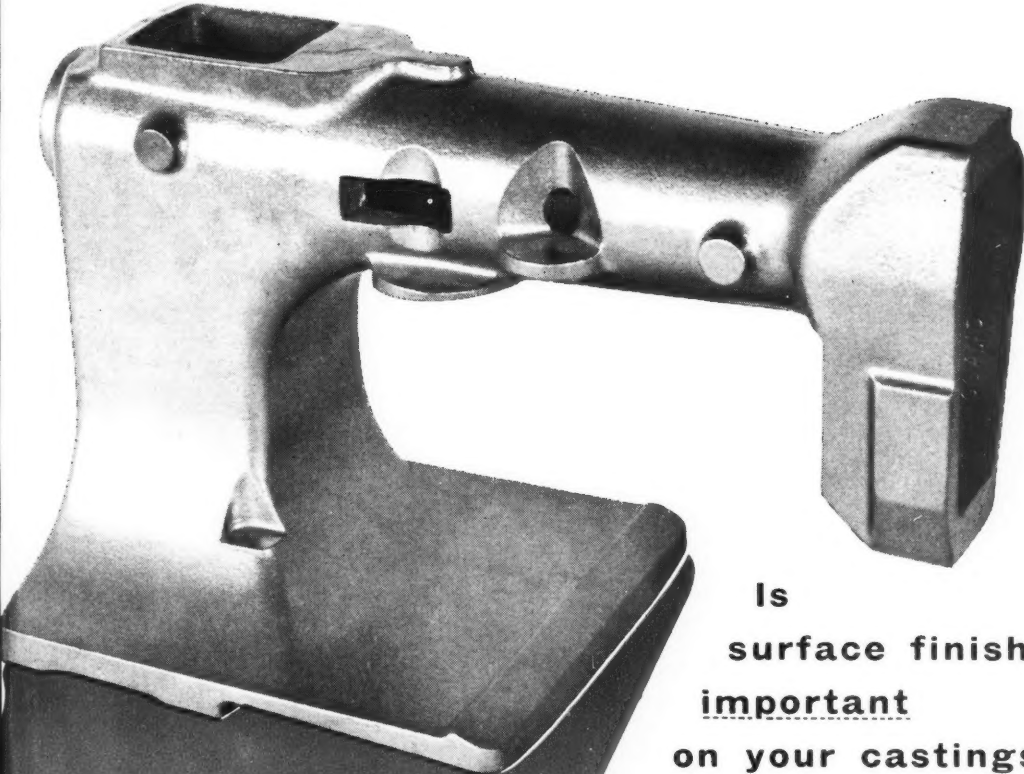

FINE MACHINE TOOLS


FINE MACHINE TOOLS
CHAPPUIS
Progressive Tool
Presses
BURKHARDT
& WEBER
Multi-spindle Drilling
Machines
JOHANSSON
Production
Universal
Grinding
Machines
MALMEDIE
Cold Heading Machines
REINECKER
Grinding Machines
Sole concessionaires
for the
United Kingdom
Stuart
DAVIS
LTD
STONEBRIDGE HIGHWAY, WILLENHALL, COVENTRY, ENGLAND.
Telephone: Toll Bar 2302/3
Grams: Machinery, Coventry

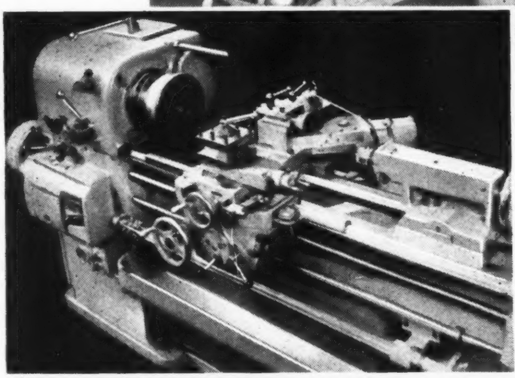

VICKERS Hydraulics

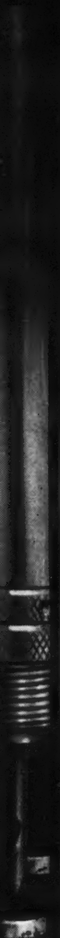



Photograph by courtesy of
F. Perkins Ltd., Peterborough




Fitted as Standard Equipment
HEPWORTH
hydraulic copying equipments
... to the Lang
13" centre lathes





S

Wardson

a famous SHEFFIELD name for
MILLING CUTTERS

125 years experience in the design and manufacture of cutting tools ensures that no matter how intricate or unusual the cutting problem there's a "WARDSON" Cutting Tool to solve it.

"WARDSON" Cutting Tools cover every mechanical cutting operation on metal, wood, leather, plastics, glass, paper and many other natural or synthetic materials.

Slitting Saws, Rotary Cutters,

Machine Knives, Tool Bits,

Screw Slotting Saws,

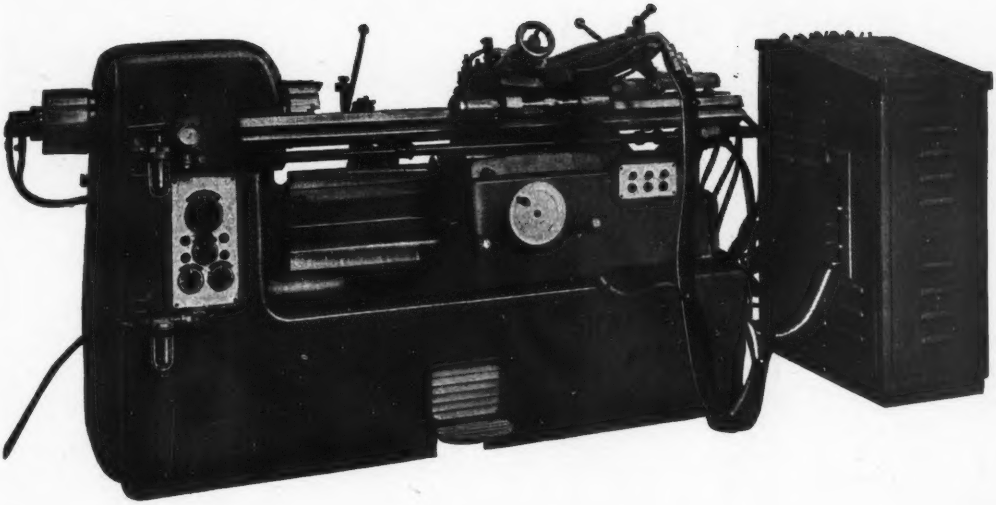
Ground Flat Stock.

Wm. WARD & SON (SHEFFIELD) Ltd.

Centenary Works, Woodseats Road, Sheffield 8, England.

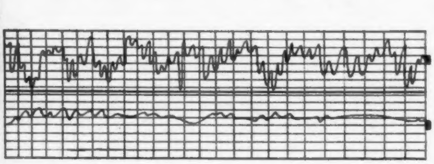
Telephone: 52451 (2 lines). Telegrams: "Wardson, Sheffield 8".

Registered Trade Marks: "Wardson", "Rubicon".



reamers

cost no more ream smoother holes and last longer



Surface finish reading from bore with a standard finish Reamer.

Note improved surface finish obtained from PRESTO 'Superfinish' Reamer.

The cutting lands of PRESTO 'Superfinish' Reamers have a surface finish to 2 micro inches— thus ensuring improved finish in the holes produced and increased tool life through resistance to metal pick-up.' PRESTO 'Superfinish' Reamers are supplied at no extra charge and are available in hand and machine types in sizes 5/16″ to 1″.

PRESTO

PRESTO tools are made by:-

EASTERBROOK, ALLCARD & CO. LTD. PENISTONE ROAD, SHEFFIELD, 6
Telephone : 348931

LONDON STOCKS:—	**BIRMINGHAM STOCKS:—**	**MANCHESTER STOCKS:—**	**GLASGOW STOCKS:—**
92-94, BOROUGH HIGH ST., S.E.1.	EAST INDIA HOUSE, HELENA ST., PARADE, 1.	582, STRETFORD RD., 16.	74, YORK ST., C.2.
Phone: HOP 4511-4	Phone: CENTRAL 6997 & 6880.	Phone: TRAFFORD PARK 2851.	Phone: CITY 4691.

961

at

W9
115

Au

"Stellite" 100 is a medium priced cutting alloy which is tougher than carbide and gives greater production than high speed steel. It is used for machining practically all metals and materials and excels at machining stainless, heat resistant and high tensile steels. It is a high production alloy which can be ground on normal grinding wheels.

Write for our publication B.14 which gives further details.

DELORO STELLITE

DELORO STELLITE LIMITED · STRATTON ST. MARGARET · SWINDON · WILTSHIRE
DELORO STELLITE (DIV. OF DELORO SMELTING & REFINING CO. LTD.) BELLEVILLE · ONTARIO · CANADA
AD.NO.348

:1961

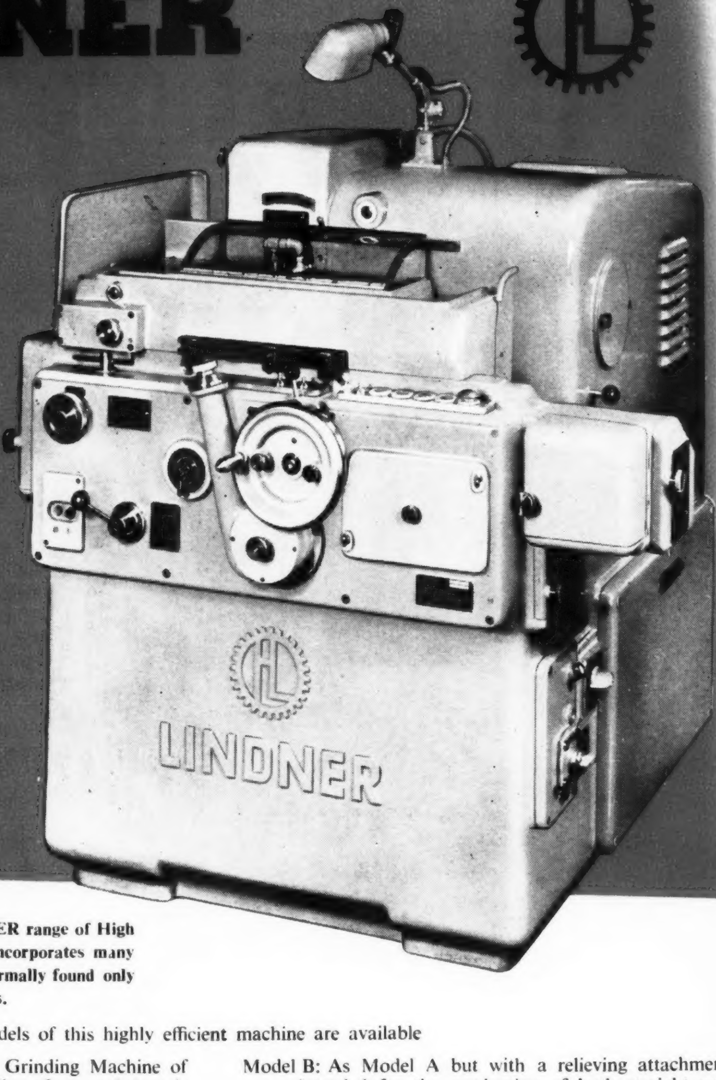
RE
DA
348

Au

LINDNER GE

'MAXIMUM SIMPLICITY... MAXIMUM ECONOMY'

THREAD GRINDING MACHINE



This smallest machine of the LINDNER range of High Precision Thread Grinding machines incorporates many of the famous LINDNER features normally found only on larger and more expensive machines.

Two models of this highly efficient machine are available

Model A: High Precision Thread Grinding Machine of highest accuracy for the grinding of external threads and annular forms, employing either the single or multi-rib wheel, particularly suitable for producing thread plug gauges, measuring and micrometer screws.

Model B: As Model A but with a relieving attachment intended for the production of both straight and spiral fluted taps, and also gives excellent results when used to produce highly accurate threads on small component parts.

Both models will accommodate up to 1in. (25 mm) diameter by 7½in. (190 mm) long

Maximum length of thread ground 3½in. (90mm)

Maximum swing over table 2⅜in. (60 mm) wheel diameter 20in. approx. (500 mm).

Provision is made for grinding threads of perfect form from 200 to 6 TPI (125 mm to 4 mm pitch)

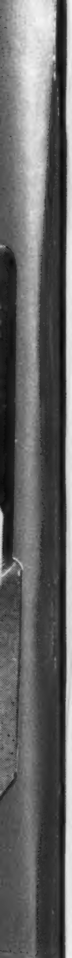
STEDALL MACHINE TOOL CO.

192-204, PENTONVILLE RD, LONDON, N.1

Telephone: TERminus 3699

Also at MANCHESTER · LEICESTER · BRISTOL · GLASGOW

1961



ment
and
ults
on

ow

A

B

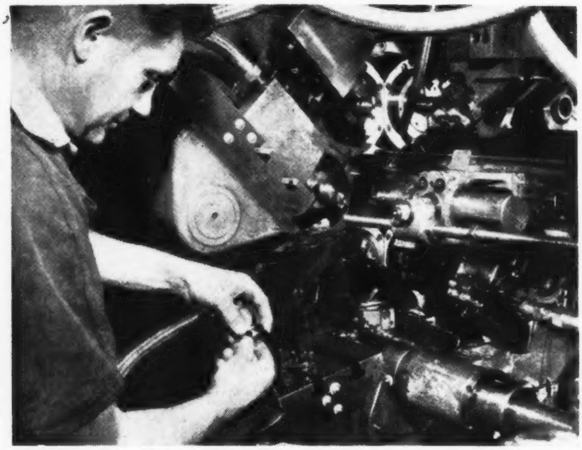
MACREADY'S USALED

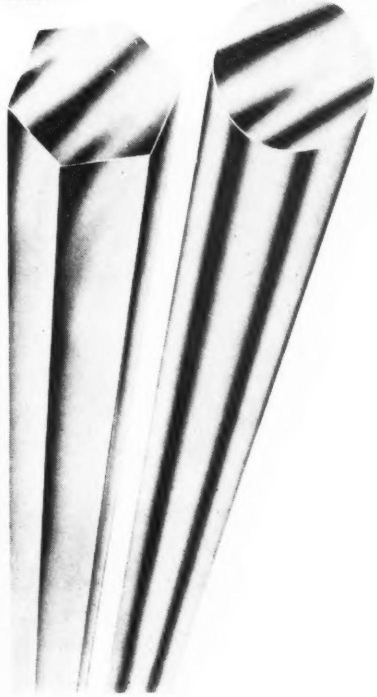
STEEL STOCKHOLDER SERVICE

Leadbearing freecutting bright steel

B.S. 970 1955 En. I.A.

The addition of 0·15—0·35% lead alloy to Usaspead freecutting steel, produces USALED, a leadbearing, freecutting bright steel specially for use with automatic lathes. Cutting speeds can be increased by up to 25% more than normal freecutting steel, and output can be increased by an amount equal to a working day per week.





MACREADY'S SUPERLED

Leadbearing freecutting bright steel

B.S. 970 1955 En. I.B.

The newest addition to the Macready range of freecutting steels has a higher machinability index than any other analysis of steel, and its use on modern automatics produces parts which previously could only be machined economically from brass.

Full descriptive literature is available on request.

A complete range of steels to B.S. 970 : 1955 (En Series) is available.

Produced specifically for capstans and autos

14th ENGINEERING EXHIBITION 1961

ROYAL HORTICULTURAL SOCIETY'S NEW HALL LONDON SW1 17 18 19 OCTOBER 1961

ENGINEERING INDUSTRIES ASSOCIATION

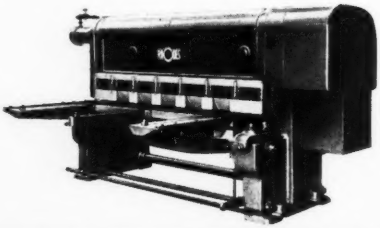
MACREADY'S
METAL COMPANY LIMITED
USASPEAD CORNER,
PENTONVILLE ROAD, LONDON, N.I.

Telephone: TERminus 7060 and 7030 (30 lines)

Telegrams: Usaspead, London, Telex. Telex No. 22788.

RHODES patented FLUID DRIVE SHEARS......

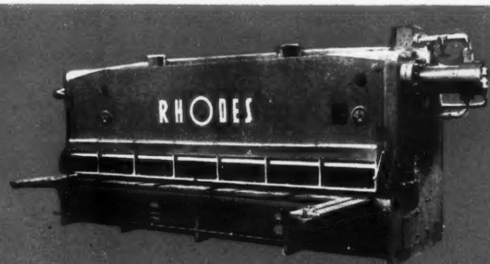
SERIES A



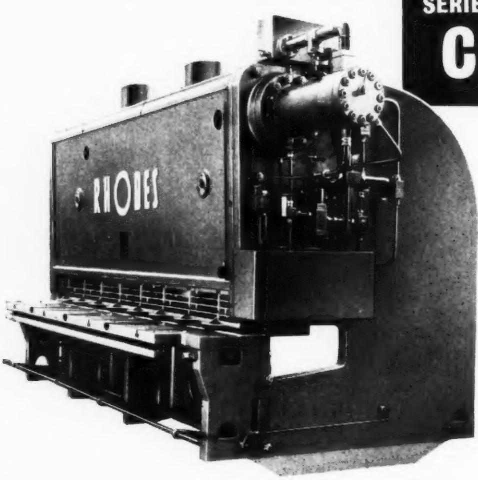
Capacity to $\frac{1}{8}$"; effective length of cut from 6 ft. to 16 ft. according to machine size.

SERIES B

Capacity to $\frac{1}{4}$" and $\frac{3}{8}$", length of cut 6 ft. to 16 ft. according to machine size.



SERIES C



In this series, machines are made with capacities respectively of $\frac{1}{2}$", $\frac{5}{8}$" $\frac{3}{4}$" and 1" thick, with length of cut from 6 ft. to 16 ft. according to machine size.


what's trumps ?
It depends what you are talking about. If it's hydraulic hose we can deal you all the trumps with Hyline or Aeroquip. Both are flexible hoselines working over a wide range of pressures. Aeroquip has detachable, re-usable end fittings which enable you to make up your own hoseline in a matter of minutes; whilst Hyline has swaged-on end fittings forming a complete and permanent unit.
It's safe to play cards with us—we always deal the trumps to our customers.
Hyline
SUPER OIL SEALS & GASKETS LTD
FACTORY CENTRE · KINGS NORTON · BIRMINGHAM 30
Telephone: Kings Norton 2041
Aeroquip

1961

new
d th
OTA
atent

pecia
achi

- AC
AN

- PA
DE
OF
TH
TH

- TA
HY

- QU
LO

- EC
FL

1961

25
11
—

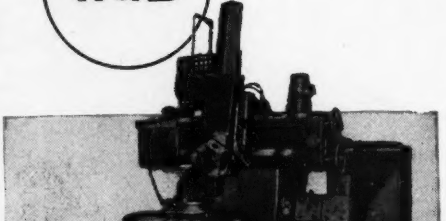
152

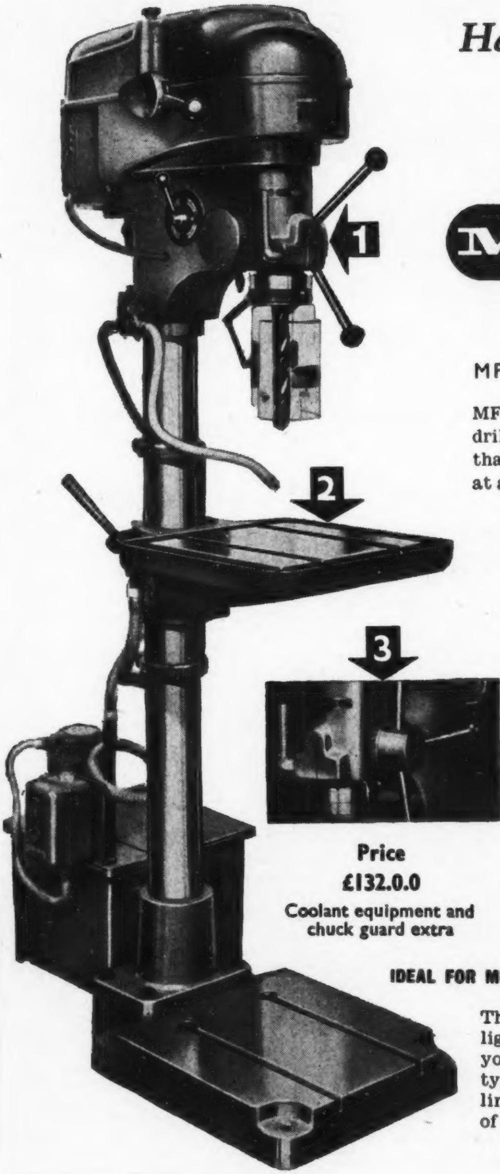
A


2110 2110
B·S·A
HALL No. 2
STAND No. 2110
7th EUROPEAN MACHINE-TOOL EXHIBITION
E
BRUSSELS 3-12 SEPT
B.S.A. TOOLS LTD
STAND 2110
TRADE MARKS
B·S·A TOOLS DIVISION
machine tools, small tools, accessories, broaches, limit switches and, on adjoining stand No. 2007, The Churchill Machine Tool Co. Ltd. (B.S.A. Group), precision grinding machines.
B.S.A. TOOLS LTD · KITTS GREEN · BIRMINGHAM 33 · ENGLAND · Tel. STECHFORD 3071
B.S.A. SMALL TOOLS LTD · MONTGOMERY STREET · BIRMINGHAM 11 · ENGLAND · Tel. VICTORIA 2381
B.S.A. BROACH CO. LTD · REDDITCH · WORCS · ENGLAND · Tel, REDDITCH 3291
Cables:—MADRICUT BIRMINGHAM · TELEX 33-307

F


For faithful reproduction of intricate profiles
automatically
from simple quickly produced templates
and reversion to manual control at will
W&B
PROFILE TURNING AND BORING





Here's precision plus— at the right price!

YOU'LL BE 100% SURE OF IT WITH A

MEDDINGS Pacera

MF5 Mk II DRILLING MACHINE 1" CAPACITY

MF5 Mk II—here's your codeword for accurate, economic drilling! Everything about this robust job adds up to just that! And what other machine offers such a specification at a comparable price?

Solid construction throughout means you've got real stability. The column is solid steel, 3¼" diameter, and is ground all over. An oil immersed gearbox, totally enclosed in the Drill Head, gives eight spindle speeds (range 80-1,500 r.p.m.). Throat depth 9". Choice of High or Low speed setting for each of four Vee belt positions, thanks to accessible gear change lever with positive action.

1. Complete rigidity from No. 3 M.T. taper (internal type).

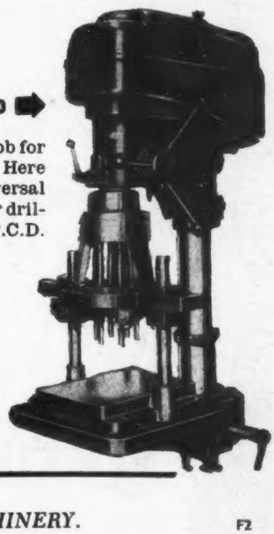
2. Maximum rigidity again from the extra large drill table-ground working surface is over 225 sq. in., and you have rack and pinion for raising and lowering, and ample coolant trough.

3. Friction/clutch type Depth Stop—integral with star wheel—has graduated scale for accurate depth drilling.

Price
£132.0.0
Coolant equipment and chuck guard extra

IDEAL FOR MULTI-SPINDLE DRILLING TOO

The MF5 Mk II is just the job for light multi-spindle work. Here you see it fitted with a universal type multi-spindle Head for drilling up to a maximum P.C.D. of 6".



VISIT US ON STAND
6103, HALL 6
7th European Machine Tool Exhibition, Brussels, Sept. 3-12

Write for particulars to the Makers:

W. J. MEDDINGS LTD.
IPSWICH ROAD, TRADING ESTATE, SLOUGH, BUCKS.
TELEPHONE: SLOUGH 26761 (5 LINES)


A SPRING IS A CONTRIVANCE FOR STORING ENERGY
Its application and design are legion
TELEPHONE: 0465
The WEST BROMWICH SPRING CO. LTD.
Pressing... large & small in spring steel, mild steel & all non-ferrous metals
GEORGE ST., WEST BROMWICH

50,000

OIL-SEALED ROTARY COMPRESSORS

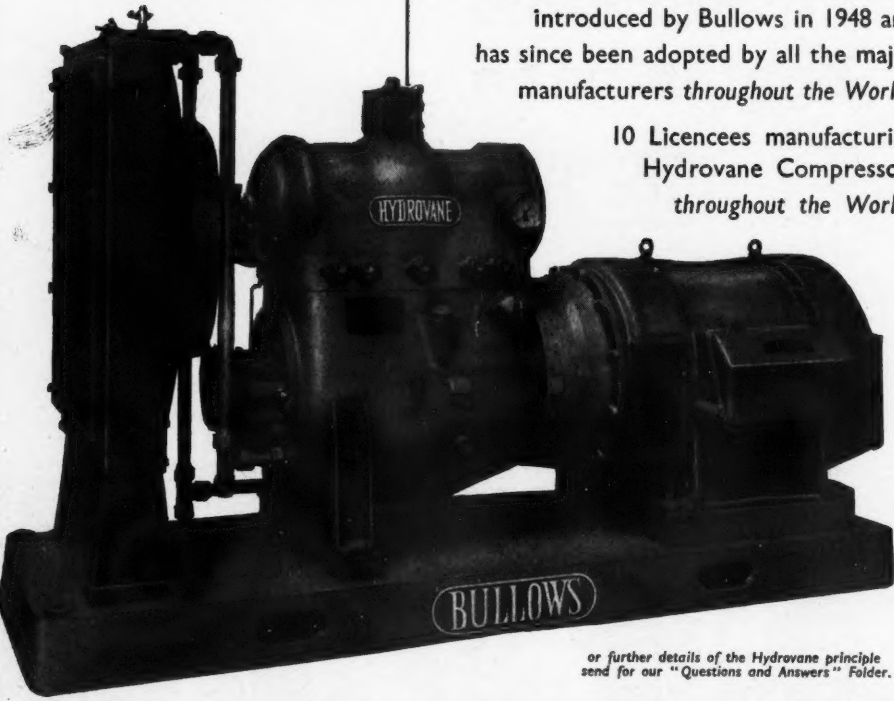
FROM 1/3-250 H.P.

HYDROVANE BULLOWS

IN USE *throughout the World !*

The Hydrovane principle was developed and introduced by Bullows in 1948 and has since been adopted by all the major manufacturers *throughout the World!*

10 Licencees manufacturing Hydrovane Compressors *throughout the World!*



or further details of the Hydrovane principle send for our "Questions and Answers" Folder.

AIR COMPRESSORS · SPRAY PAINTING EQUIPMENT · SPRAY BOOTHS

ALFRED BULLOWS & SONS LTD

HEAD OFFICE & WORKS LONG ST WALSALL STAFFS ENGLAND TEL: 27251

Makers of the original oil-sealed rotary compressors

DEPOTS AT:—13, SOUTH MOLTON STREET, LONDON, W.1	TELEPHONE: MAYFAIR 2313
55A, BRIDGE STREET, MANCHESTER 3	TELEPHONE: BLACKFRIARS 5670
70, GILMOUR STREET, GLASGOW, C.5	TELEPHONE: SOUTH 2383
61/63, DRURY STREET, DUBLIN	TELEPHONE: DUBLIN 73188/9

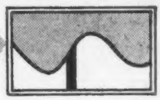
BULLOWS (AUST.) PTY. LTD., ETHEL AVENUE, BROOKVALE, SYDNEY, AUSTRALIA.

The quick and simple modern way of grinding form tools, gauges, etc., with high accuracy

The PeTeWe Projection Form Grinding Machine is the answer to many of the problems of production associated with the grinding of complicated shapes and forms to high degrees of accuracy and in materials such as tungsten carbide. The drawing, the workpiece and the grinding wheel are all clearly visible on the same large size screen and control of the grinding operations is extremely simple.

The PFS 3d machine illustrated grinds work up to 2in. thick or 4in. diameter and it is AVAILABLE FOR EARLY DELIVERY.

the drawing
the workpiece
the wheel



are all on the same screen on the

PeTeWe

Projection Form Grinding Machine

Sales and Service for the British Isles

DRUMMOND-ASQUITH LIMITED

Member of the Asquith Machine Tool Corporation

KING EDWARD HOUSE, NEW ST., BIRMINGHAM *Phone: Midland 3431.* *Also at LONDON Phone: Trafalgar 7224 & GLASGOW Phone: Central 0922*

IF 497


HAUSER
START
STOP
Optical
JIG BORING and
JIG GRINDING MACHINES

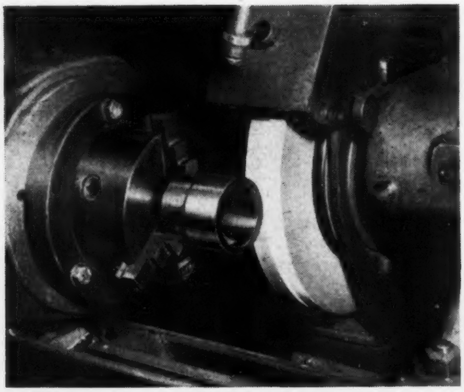
TY
P

A
hi
an
W
M
D
A

•

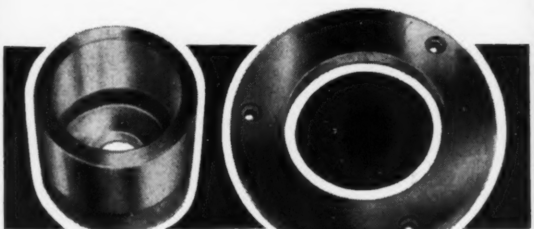
T
C

this caps the lot!



Jones-Shipman Semi-Universal Precision Grinders are installed for carrying out tbe grinding operations which are to tolerances of less than one ten-thousandth of an inch.

PRECISION GRINDING
PUNCH & DIE-SETS
for **BOTTLE CAPPERS**
at **FORDS (FINSBURY) LTD.**
KEMPSTON, BEDFORD



Fords (Finsbury) Ltd., specialize in the manufacture of Capping and Sealing Machines for the bottling industry. The punch and dies are sealed in the presses and guaranteed to cap 75 million bottles without replacement. This figure is most frequently exceeded and only recently a toolset in one of Fords presses in Sweden punched the caps for no less than **142,000,000 bottles.**

J & S

JONES - SHIPMAN

A. A. JONES & SHIPMAN LTD. LEICESTER. Tel.: 823222. **London Office: 50/52 Great Peter Street, S.W.1. Tel.: Abbey 5908/9**

961

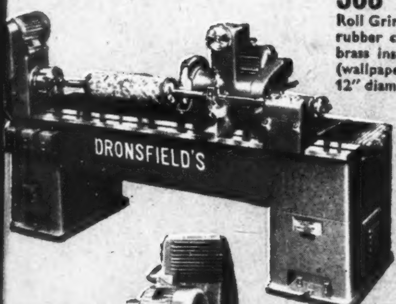
/9

51
Knif
for
shea

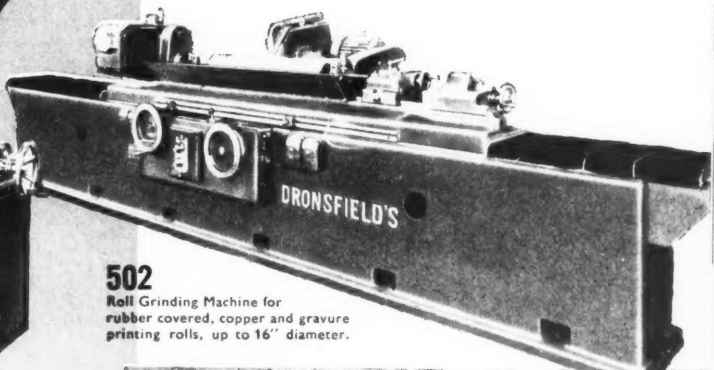
precision grinding machines

by DRONSFIELD'S

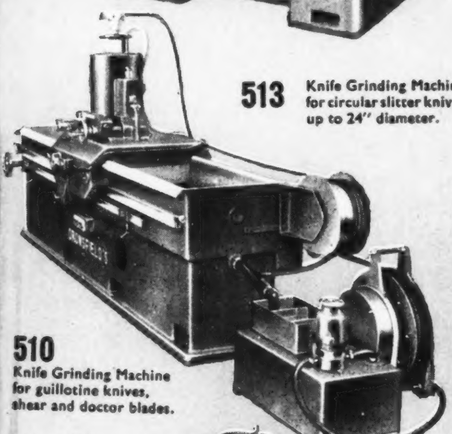
For all maintenance work in paper mills.
Camber Grinding a speciality.



508
Roll Grinding Machine for rubber covered rolls and brass inset printing rolls (wallpaper trade), up to 12" diameter.

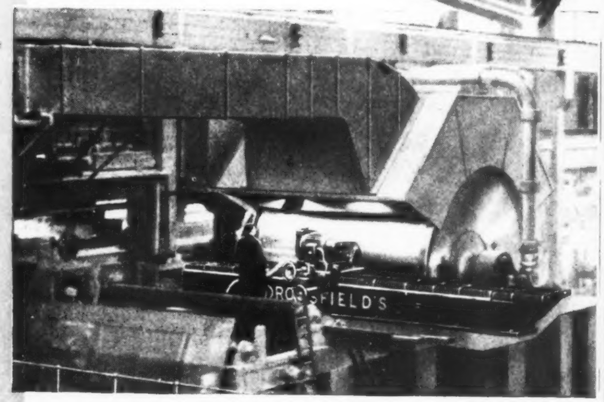


502
Roll Grinding Machine for rubber covered, copper and gravure printing rolls, up to 16" diameter.



513 Knife Grinding Machine for circular slitter knives up to 24" diameter.

510
Knife Grinding Machine for guillotine knives, shear and doctor blades.



501A

501 Roll Grinding Machine for all types of rolls from 6" to 60" diameter.

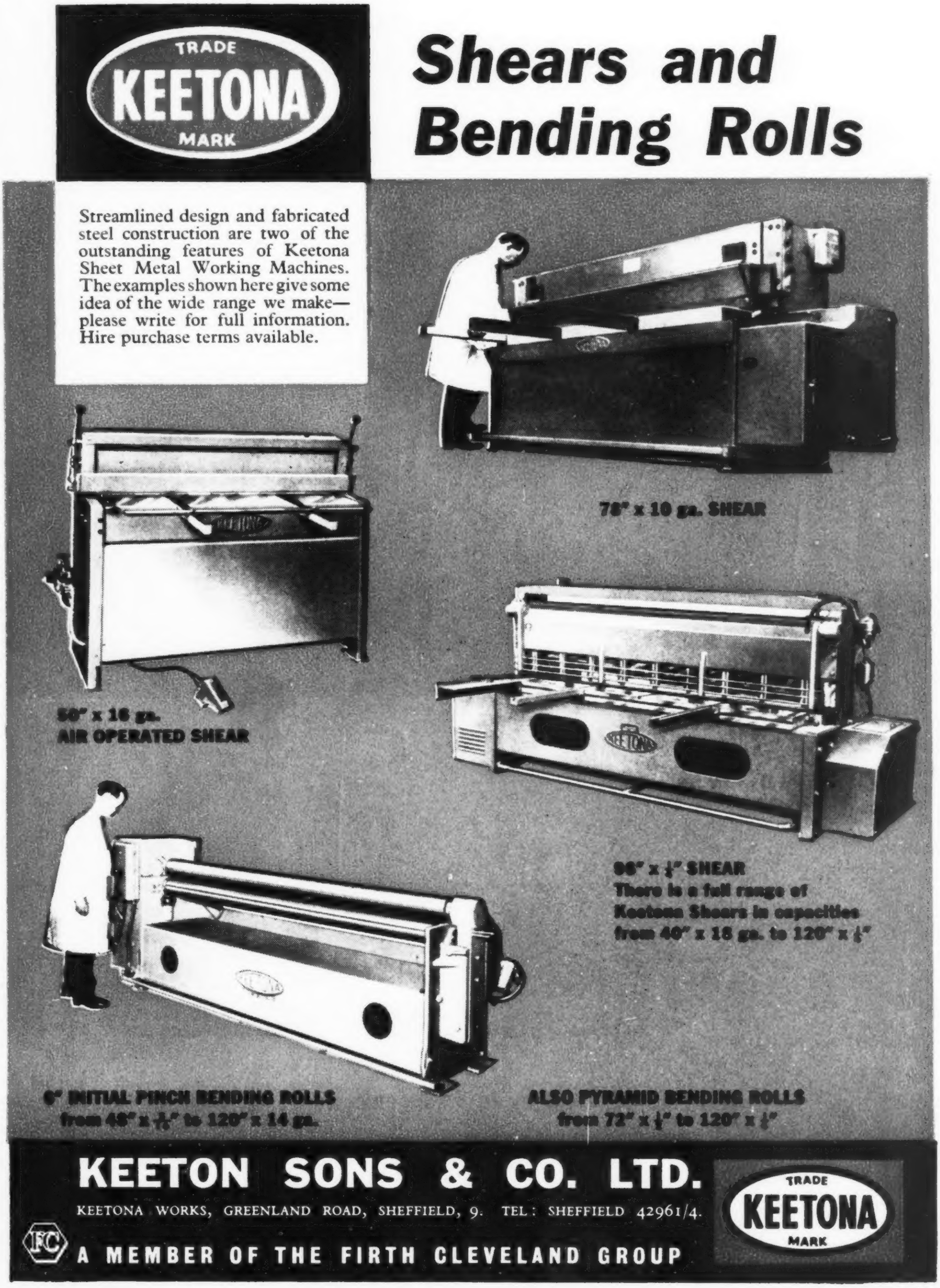
DRONSFIELD BROTHERS LT
ATLAS WORKS · OLDHAM · ENGLAND


IF YOU USE
POWER
YOU NEED
FERODO
Longer life with fewer replacements
Consistent transmission of power
Safe, dependable braking and control
Fit Ferodo first - to last
FERODO
FRICTION LININGS FOR INDUSTRY
FERODO LIMITED · CHAPEL-EN-LE-FRITH
A Member of the Turner & Newall Organisation

10/19


cut in one pass in a THREADING
TIME of 35 seconds
1¼"
3¼"
6 t.p.i. full ACME
thread in ·45%
CARBON STEEL

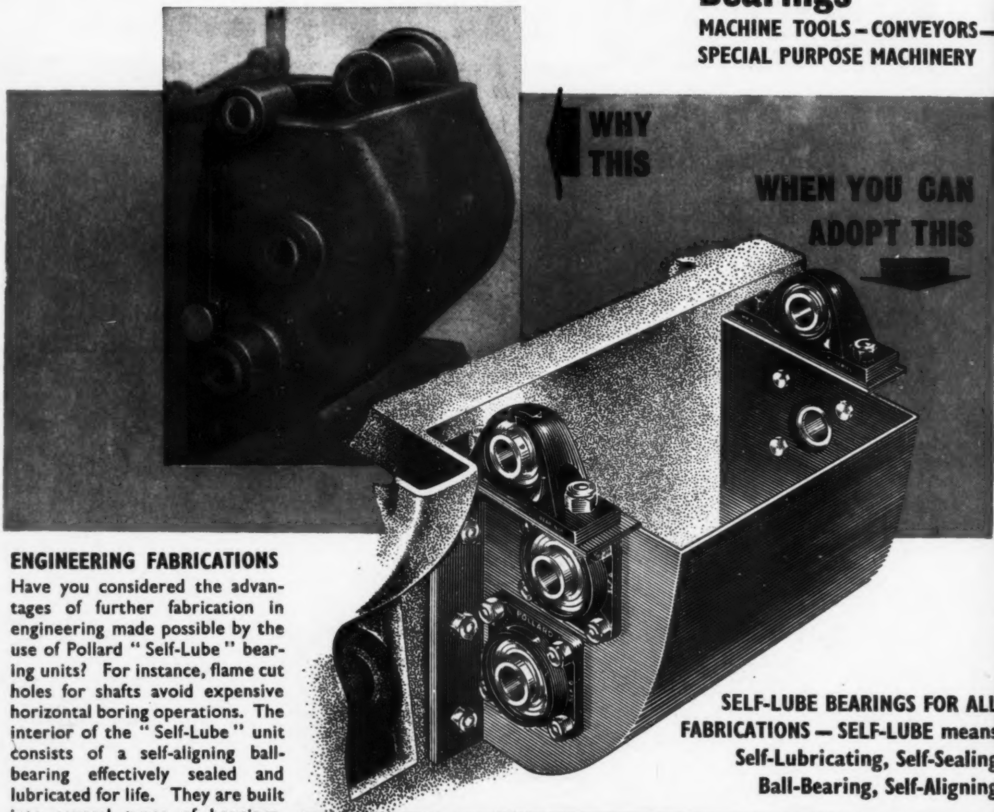
Au


TRADE
KEETONA
MARK
Shears and Bending Rolls
Streamlined design and fabricated steel construction are two of the outstanding features of Keetona Sheet Metal Working Machines. The examples shown here give some idea of the wide range we make—please write for full information. Hire purchase terms available.
78" x 10 ga. SHEAR
50" x 16 ga.
AIR OPERATED SHEAR
96" x ¼" SHEAR
There is a full range of Keetona Shears in capacities from 40" x 18 ga. to 120" x ¼"
6" INITIAL PINCH BENDING ROLLS
from 48" x $\frac{3}{16}$" to 120" x 14 ga.
ALSO PYRAMID BENDING ROLLS
from 72" x ¼" to 120" x ½"
KEETON SONS & CO. LTD.
KEETONA WORKS, GREENLAND ROAD, SHEFFIELD, 9. TEL: SHEFFIELD 42961/4.
FC
A MEMBER OF THE FIRTH CLEVELAND GROUP
TRADE
KEETONA
MARK

CRC 12KM

Fabricate with 'SELF-LUBE' Bearings

MACHINE TOOLS – CONVEYORS – SPECIAL PURPOSE MACHINERY

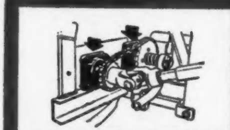


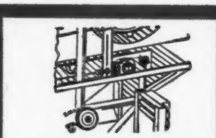
SELF-LUBE BEARINGS FOR ALL FABRICATIONS — SELF-LUBE means Self-Lubricating, Self-Sealing Ball-Bearing, Self-Aligning

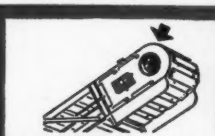
ENGINEERING FABRICATIONS

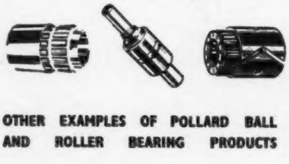
Have you considered the advantages of further fabrication in engineering made possible by the use of Pollard "Self-Lube" bearing units? For instance, flame cut holes for shafts avoid expensive horizontal boring operations. The interior of the "Self-Lube" unit consists of a self-aligning ball-bearing effectively sealed and lubricated for life. They are built into several types of housings, some of which are illustrated. These units are supplied to suit shafts ½in. to 6in. diameter. May we send you further details?

We have available on request details of many types of housings —specially manufactured to suit customers' requirements.


SPECIAL PURPOSE MACHINERY


AGRICULTURAL MACHINES


ELEVATORS


OTHER EXAMPLES OF POLLARD BALL AND ROLLER BEARING PRODUCTS

POLLARD BEARINGS LTD

FERRYBRIDGE · KNOTTINGLEY · YORKSHIRE

Telephone: Knottingley 2323 (5 lines). Telegrams: "Balbearing Ferrybridge." Telex: 55166
LONDON OFFICE: 44 Hertford Street, W.1. Telephone: HYDe Park 3888. Telex: 23549
NORTHAMPTON WORKS: Countess Road. Telephone: Northampton 3766. Telex: 31624
CANADIAN POLLARD BEARINGS LTD: Oakville, Ontario. Telephones: VI. 5-1667, EM 4-5035
Hamilton Customers: Dial 110 ask for Zenith 38600
PARIS OFFICE: Pollard-Roulements, 6 Boulevard Pershing, Paris 17e.

POLLARD PB BEARINGS


PORTABLE PYROMETER
IMPRESSIONS/MINUTE
FAHRENHEIT
R.P.M.
SMITHS

SMALL HORIZONTAL SPINDLE SURFACE GRINDER

NEW MATTISON SURFACE GRINDER gives 4 way improvement!

1 ACCURACY
Through new design of base, table columns, cross slide and hydraulics.

2 OPERATION
Automatic reset, optional automatic downfeed and optional power table positioning.

3 FINISH
Through isolated hydraulic system and rugged construction.

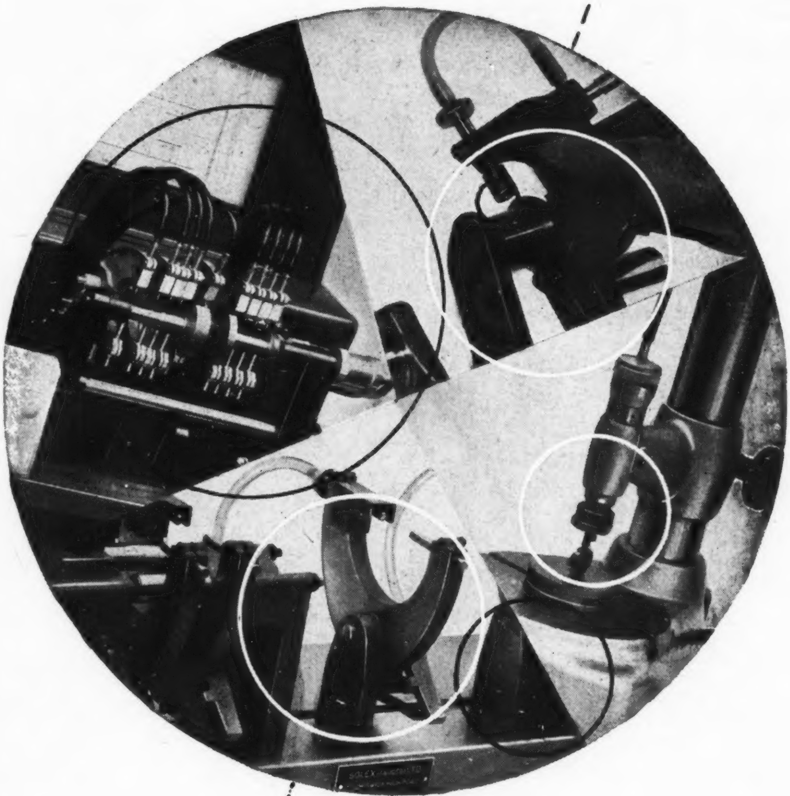
4 MAINTENANCE
New features improve protection of parts and reduce cost of servicing.

For closer tolerances and finer finish on production operations, greater precision is now available in this highly improved surface grinder. The new line of Mattison grinders represents a comprehensive improvement of what was already the best horizontal machine on the market. Send for full data—now!

NRP 3425

GASTON E. MARBAIX LTD.

DEVONSHIRE HOUSE, VICARAGE CRESENT, BATTERSEA, LONDON S.W.11. Phone: Battersea 8888 (8 lines)

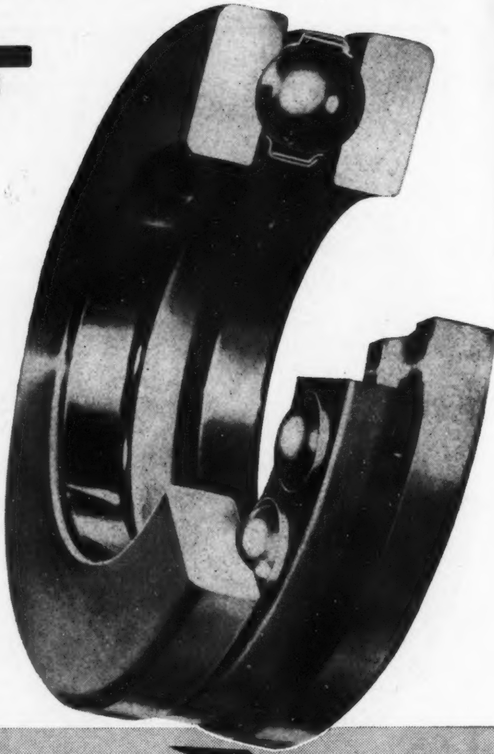


FOR EXTERNAL MEASUREMENT OF DIAMETERS

ONLY SOLEX HAVE THE MEASURE OF THINGS

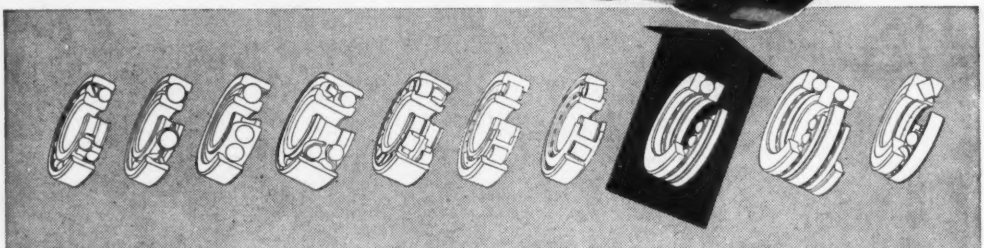
Solex (Gauges) Limited, 72 Chiswick High Road, W.4. CHIswick 4815

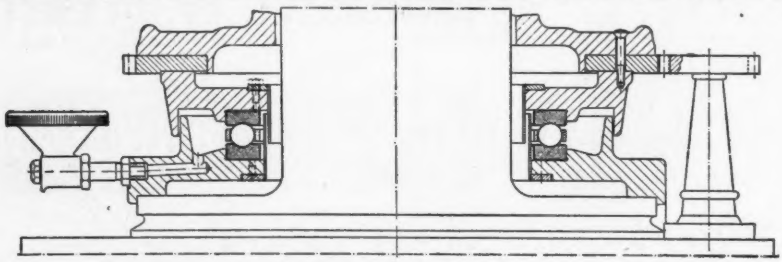
Only SKF *can offer such a wide selection of British made bearings*



The bearing illustrated is the single thrust ball bearing, designed to deal with axial loads acting in one direction. The housing ring may have a flat seating, or where appropriate a spherical seating with matched seating-ring to compensate for minor misalignments in the housing.

Every SKF bearing has behind it not only unrivalled manufacturing facilities, but a unique fund of world-wide experience in the design and application of rolling bearings. This experience is at your service for the asking, at any one of the twenty Skefko Branch Offices in the British Isles or at Luton.





Thrust bearing for lighthouse lens system

THE SKEFKO BALL BEARING COMPANY LIMITED · LUTON · BEDS

THE ONLY BRITISH MANUFACTURER OF ALL FOUR BASIC BEARING TYPES: BALL, CYLINDRICAL ROLLER, TAPER ROLLER AND SPHERICAL ROLLER

G179

MACHINERY is registered as a newspaper at the General Post Office and is published every Wednesday by The Machinery Publishing Co., Ltd. The name is a registered trade mark.

LONDON OFFICE

REGISTERED OFFICE, EDITORIAL, SMALL AND CLASSIFIED ADVERTISEMENTS DEPARTMENTS AND ENQUIRY BUREAU

CLIFTON HOUSE
83-117 EUSTON ROAD
LONDON, N.W.1

Telephone: Euston 8441/2
Telegrams: Machtool, Norwest, London

HEAD OFFICE

SUBSCRIPTION, ADVERTISEMENT, SERVICE, PHOTOGRAPHIC, ACCOUNTS AND BOOK DEPARTMENTS

NATIONAL HOUSE
21 WEST STREET,
BRIGHTON, 1

Telephone: Brighton 27356 (4 lines)

Telegrams: Machtool, Brighton

NEW YORK: 93, Worth Street

PARIS: 15, Rue Bleue

PRICE PER COPY:—One shilling and threepence.

SUBSCRIPTIONS:—Inland and overseas, 52 shillings per annum (and pro rata), post free. Cheques and Money Orders should be made payable to the Machinery Publishing Co., Ltd.

ADVERTISEMENTS:—Copy for displayed advertisements, if proofs are required, should reach the Brighton office 21 days in advance of publication. Rates on request.

Small (classified) advertisements can be accepted, space permitting, at the London office up to Wednesday, for publication on the following Wednesday. For rates, see p. 127.

Blocks are held at advertisers' own risk; no responsibility for loss is accepted by the publishers.

MACHINERY

A JOURNAL OF METAL-WORKING PRACTICE & MACHINE TOOLS

Vol. 99, No. 2544 — August 16, 1961

MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

COPIES PRINTED	11,500 per week
CERTIFIED DISTRIBUTION	11,293 per week
CERTIFIED PAID DISTRIBUTION	9,827 per week
Copies sold at full price	9,594 per week
Copies sold at reduced prices	233 per week

CONTENTS

Abstracts of Principal Articles

Producing Gas Turbine Components P. 348

The Aero-engine Division of Rolls-Royce, Ltd., located at Derby, is now concerned solely with the production of gas-turbine engines of various types. Avon gas turbines fitted to the Comet and Caravelle aircraft are provided with thrust reversers, and the main component, known as a thrust reverser box, is a weld-fabricated Nimonic assembly. Arcuate facings on this unit are milled on a Kendall & Gent machine, which has been adapted by Rolls-Royce, Ltd. Certain members of the welded assembly are machined from frames made by welding extruded Nimonic section. These frames are of arcuate form and are milled on a Cincinnati machine with hydraulic copy-control, which has been adapted by the company. The thrust reverser of the Conway engine incorporates a welded Nimonic assembly which forms a bellows seal, and has two eliptical flanges inclined relative to the main axis. The edges and lower faces of both flanges are machined at one set-up on a Webster & Bennett vertical turning and boring mill, equipped with an indexing fixture and a cam-operated profiling slide. Conway nozzle box outer casings are profile milled on a specially-built Cincinnati Hydrotel machine, with coupled rotating tables for the work and master. Hydraspeed heavy-duty serrated cutters are used for rough milling, and the machine has provision for varying the table speed to maintain a constant work feed rate. (MACHINERY, 99—16/8/61.)

Planning for the AEI Numeritrol Numerical Control System .. .. .. P. 359

This article is the second of two dealing with the AEI Numeritrol magnetic-tape numerical control system for machine tools, and describes the procedure for planning for a specific workpiece. The machine user compiles a planning sheet, and from this information produces a punched-paper tape, which is identified as Tape *A*. This tape is sent to the AEI Tape Service Centre at Leicester, where it is fed through a general-purpose computer which converts the dimensional data relating to the periphery of the workpiece into terms of the path to be followed by the centre of the cutter. The output from this computer is in the form of a second punched-paper tape (Tape *B*) and the latter is then fed to a special-purpose computer, known as the Director. This unit converts the incremental information into continuous data, and records it directly on to a magnetic tape, which is subsequently used to control the machine tool. (MACHINERY, 99—16/8/61.)

The Activities of Paterex, Ltd. .. P. 366

Paterex, Ltd., who are concerned with the quantity production, on a contract basis, of a wide variety of components from steel bar, have recently occupied an entirely new factory which has a floor area of 35,000 sq. ft., at Cray Avenue, St. Mary Cray, Orpington, Kent. A total of 105 single-spindle automatics with bar capacities up to 1½ in., also capstan lathes, centreless grinders, thread rolling machines, a Cri-Dan automatic screwcutting lathe and a number of other machines, on which second operations are carried out on certain components, are installed. The company has built an automatic machine with a hopper feed unit for chamfering the bores of blanks for special nuts, also a multiple-barrel finishing machine, which enables a number of fairly large batches of small components to be handled simultaneously. (MACHINERY, 99—16/8/61.)

Slack & Parr Unit Head Machines .. P. 369

Unit head machines built by Slack & Parr, Ltd., Kegworth, near Derby, for performing such operations as drilling, tapping, countersinking, spot-facing, and in-line reaming, on pistons for disc brakes, bail components for domestic vacuum cleaners, acoustic-insulating boards, and frame components for dictating machines, are described in this article. On most machines, the air-hydraulic unit heads, which are of Slack & Parr design, are fitted with the company's gearless multi-spindle drilling attachments. In addition, details are given of set-ups on the firm's air-hydraulic bench-mounted drilling machines, fitted with multi-spindle attachments and special work-holding fixtures, for drilling ear and mouthpiece components for telephones, and small diameter spindle components for electric shavers, also for drilling and tapping cylinder heads for air compressors. (MACHINERY 99—16/8/61.)

IN FORTHCOMING ISSUES

Producing the Smiths automatic transmission—Numerical control applied to Pratt & Whitney machines for inspection.

Contributions to MACHINERY

If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

The Attitude of Small and Medium-sized Firms to Export Trade

In a recent issue of MACHINERY attention was drawn to the growing importance of the contributions which are made by the various branches of the metal working industries to the total export trade of the country, and it was suggested that if the recent rate of expansion of exports of metals and metal products could be sustained, a more satisfactory overall growth in the value and volume of goods consigned overseas might be anticipated in the future. It is evident, however, that if this continued expansion is to be achieved an intensification of efforts will be necessary on the part of the companies which make up these branches of industry, and it is obviously desirable that these efforts should be as widespread as possible. As is well known, firms of small and medium size play a very important part in the metal working industries, as in other fields of manufacture in this country, and it is most desirable, therefore, that these smaller engineering companies should, as far as possible, participate in export trade, at least in proportion to their scales of operation.

Although there does not appear to be any definite evidence on this point, it seems reasonable to assume that it is among these smaller firms, collectively, that the greatest scope for expansion of export trade exists. Acting on this assumption, the Export Action Now Committee of the Institute of Directors has sponsored a pilot survey* which was designed to shed some light on the attitudes of typical firms in this category towards exporting, and the reasons for those attitudes. The survey covered 52 firms which were classified as medium (100 to 300 employees), small (40 to 99 employees), and very small (less than 40 employees), and of the total, 26 were concerned with engineering products and 26 with consumer goods. As the number of companies involved was necessarily so restricted, it would obviously be unwise to draw any very general conclusions from the results. Nevertheless, they undoubtedly afford some useful guidance as regards the situation prevailing, and it may be noted that of the 26 firms making engineering products 10 (6 medium, 2 small, and 2 very small) were exporting more than 10 per cent of output, 6 (2 medium, 3 small, and 1 very small) were exporting 10 per cent or less, and 10 (5 small and 5 very small) were not carrying on any export trade at all.

The firms which co-operated in the survey were also grouped in accordance with "export behaviour," and it was found that of those engaged in engineering, 27 per cent were exporting fairly vigorously, 38 per cent reported that exports were declining or were static at a fairly low level, 8 per cent were non-exporters and although desirous of entering the export field were uncertain as to what action to take, and 23 per cent did not export, had never exported, and showed no real interest.

How are these differences to be explained? After making due allowance for the "modest and restricted" scale of the study, those responsible suggest that: "In the overwhelming majority of cases, the failure of the British manufacturer to increase or even maintain his exports, or to get into the export market at all, is a function not of any external circumstances but of his general attitude towards exports."

It was noted in this connection that of the firms which were exporting vigorously and had volumes of exports that were increasing or were being maintained at a high level, "practically every one was highly active in marketing, sales promotion, and selling, or in investigating and developing new markets, or in the development of new or modified products suitable for export markets." On the other hand, among those firms which had volumes of exports that were declining, or static at low levels, or had abandoned exporting altogether, "very few indeed had attempted to do anything serious about it."

There are, it is pointed out, a wide variety of different reasons why a particular manufacturer may not be particularly anxious to devote much attention to exports. Such an attitude may be based, for instance, on the results of serious assessments as to the relative profitability of expansion in the home as against the export markets, or "a complete lack of interest in anything which might be troublesome or involve more work." Other reasons include a lack of confidence on the part of the individual in his own abilities or those of his associates, "fear of the unknown, distrust of foreigners, and a feeling of inadequacy, linked with all these (reasons) and with a lack of understanding of what

(*Continued on page* 389)

* This survey was conducted by Marplan, Ltd.

Producing Gas Turbine Components

Examples of the Methods and Equipment Employed by Rolls-Royce, Ltd., Derby

By P. A. SIDDERS, Chief Associate Editor

THE INTRODUCTION OF THE GAS TURBINE brought about radical changes in the machining techniques and equipment employed for the production of components for aircraft engines. Operations on parts for piston engines were generally similar to those employed in the motor car industry, although the techniques were more refined to permit the maintenance of closer dimensional tolerances and higher standards of surface finish. The production of gas turbines has necessitated the development of new methods, notably for the machining and finishing of the large numbers of blades required, and the latest practices in this field have been described from time to time in MACHINERY. It has also been necessary to develop methods for machining some of the larger components of gas turbines, such as casings and rings, and fresh problems have arisen as the size of these power units has increased and castings have been replaced by weld-fabricated components in the newer heat and corrosion resistant alloys.

Rolls-Royce, Ltd., have always been in the forefront of aero-engine development, regardless of whether such engines have been of piston or turbine type. In the gas turbine field, the company made preliminary studies in 1938, and later collaborated with Sir Frank Whittle on research and development. During recent years there has been steady improvement in the power outputs of successive types of Rolls-Royce gas turbines which have been introduced, as a result of important advances in design, for example, in connection with units of the by-pass type.

A typical gas-turbine unit in current production is the civil version of the Avon turbo-jet, seen in the heading illustration, the design of which incorporates much of the experience gained as a result of extensive operation of the military versions. Developed to achieve lower fuel consumption and long life between overhauls, the civil Avon has a thrust range of 10,250 to 12,725 lb. For comparison, the military version, which went into service in 1951, has been developed to give a thrust of 13,220 lb.—more than twice the output of early engines of this type—and with re-heat, this figure is increased to more than 16,000 lb.

The civil Avon was put into operation in 1958, in a de Havilland Comet 4, for the first jet passenger service across the North Atlantic. It was then the first engine to go into service with a life between overhauls exceeding 1,000 hours. Shortly afterwards, the Avon was used to power the French Sud-Aviation Caravelle aircraft. The overhaul life of the civil Avon is now 2,900 hours, and at modern speeds, this life represents more than a million flight miles between overhauls.

Only gas-turbine engines are built by the Aero Engine Division of Rolls-Royce, Ltd., which is located at Derby. Light piston engines for aircraft are to be made, however, under licence from the Continental Motors Corporation, U.S.A., at the works of the Rolls-Royce Motor Car Division, Crewe. Some of the machining set-ups and equipment that have been developed by the company for the production of components for gas-turbine engines are here described.

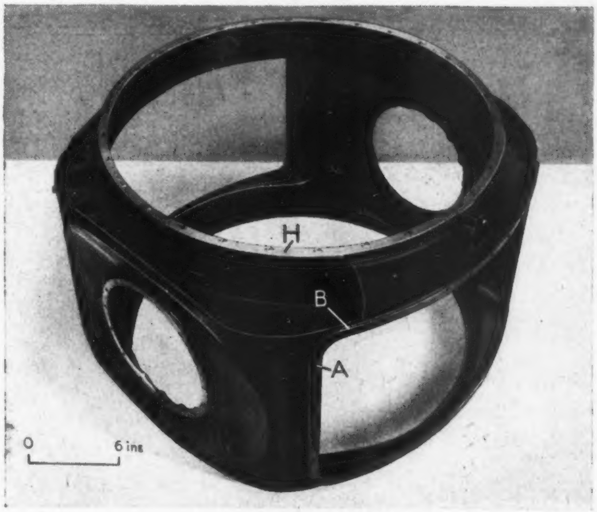


Fig. 2. A Nimonic welded assembly which forms the thrust reverser box for the Rolls-Royce Avon gas turbine engine is here seen in the partly machined condition

MILLING FACINGS ON THE AVON THRUST REVERSER BOX

It is now becoming customary to fit gas turbine engines with auxiliary units, known as thrust reversers, whereby the direction of flow of the hot gas stream, issuing from the jet pipe, can be diverted to slow down the aircraft on landing. This equipment is mounted at the tail end of the engine, and the thrust reverser assembly for the Avon engine is shown in Fig. 1. The left-hand end is coupled to the main engine casting, and at the upper left may be seen an outlet duct fitted with guide vanes to direct the flow of the jet stream. This duct is one of two, which are mounted on either side of a unit known as a thrust reverser box, wherein are housed pivoted shutters to close the main gas efflux passage at the right, and deflect the gas stream outwards.

An Avon thrust reverser box, seen in a semi-finished condition in Fig. 2, is a large welded assembly, made from Nimonic 80, with opposed arcuate facings, as at *A*. These facings provide for mounting the outlet ducts, and each facing is of part-cylindrical form, with the axis of the cylinder displaced from the axis of the box. It is necessary to machine each facing to provide a good seating for the associated component, and a shallow clearance channel, as at *B*, is also milled along one edge.

The facings are slab-milled on a specially-adapted Kendall & Gent openside machine, and a general view of the set-up is given in Fig. 3. A vertical pillar *C* has been fitted to the machine by Rolls-Royce, Ltd., and has guideways which

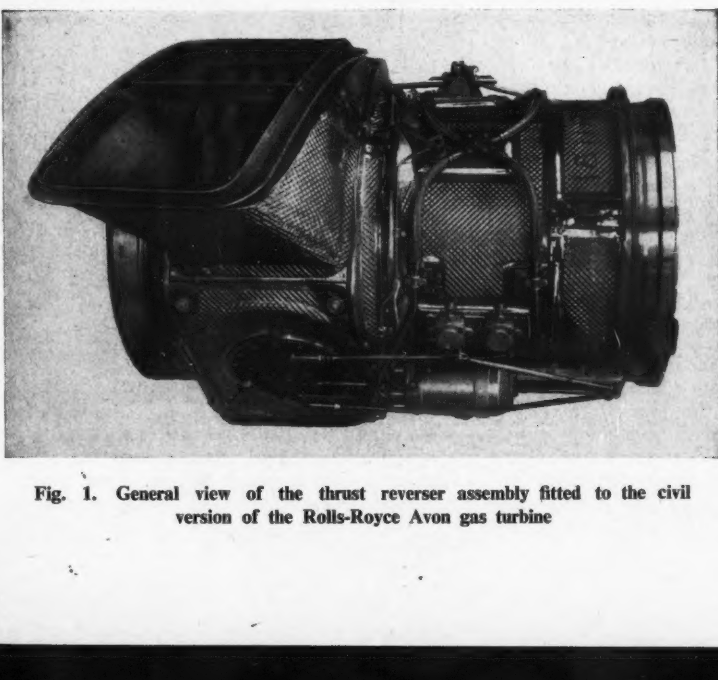


Fig. 1. General view of the thrust reverser assembly fitted to the civil version of the Rolls-Royce Avon gas turbine

Fig. 3. General view of the set-up on a Kendall & Gent milling machine for operations on the large rectangular facings on the thrust reverser box for the Rolls-Royce Avon gas turbine engine

carry an adjustable bracket *D*, with a bearing to support the lower end of the cutter arbor. This bracket is bolted to a heavy plate *E*, which is secured by screws and dowels to facings machined on the under-side of the milling head by Rolls-Royce. As may be seen, the Kendall & Gent machine is fitted with a power-driven rotary table, and the cover for the feed box of this unit has been replaced by a piece of thick steel plate *F*, which is ground on both faces. This plate remains permanently on the machine, and a block *G* is clamped to the top face to support the lower end of the pillar *C*. At the lower end, the pillar is machined flat and square with the guideways, and it is secured to the block *G* by screws that pass through slots in the bottom flange.

Fig. 4 is a close-up view of the workpiece and cutter gang, and the support bracket for the lower end of the arbor is again indicated at *D*. The support bearing has flanges which engage the upper and lower faces of the bracket, and the bearing is held in place by a swinging clamp, secured by an eye-bolt and nut. Four interlocking slab mills, of 4¾ in. diameter, are mounted on the arbor to form an assembly with an overall length of 15 in. Each cutter has 16 teeth, of 30 deg. helix angle, and the cutters are alternately of right- and left-hand helix. A 5¼-in. diameter side-and-face cutter is mounted on the arbor above the slab-mills and provides for milling the clearance channel (*B*, Fig. 2).

The sequence of milling operations provides for three roughing cuts, one finishing cut, and a channel milling stage on each facing, and the time required for setting and machining each facing is 4 hours. A cutter speed of 20 r.p.m. is employed, and for the roughing stages, the rotary table is driven to provide a feed rate of 0·25 in. per min. (on a 20-in. diameter) for milling the vertical end portions of the flange, and a feed rate of 0·6 in. per min. for the horizontal portions. For finishing, a constant feed rate of 0·25 in. per min. is employed. In-feed is applied by releasing the clamps for the support pillar

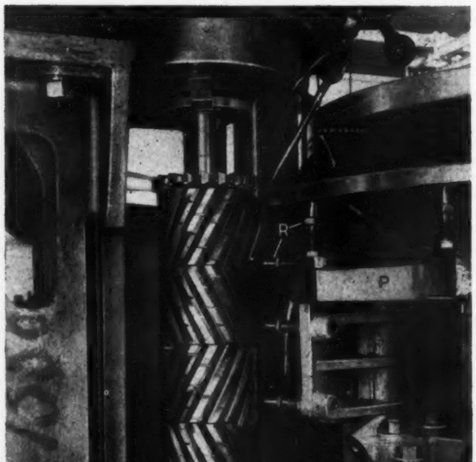


Fig. 4. Close-up view of the cutters for milling the facings on the Avon thrust reverser box. A steady bracket to support the end of the cutter arbor has been added to the machine by Rolls-Royce, Ltd.

and advancing the table of the machine towards the cutters, after which the pillar is re-clamped. The specified increments of in-feed are 0·050 in. at each roughing stage, and 0·005 in. at the finishing stage. In Fig. 3, the workpiece is seen after the first roughing stage has been completed. It may be pointed out that the total allowance of metal to be removed during rough milling of the flanges is not 0·150 in. Provision is made for three increments of 0·050 in., however, to allow for any slight misalignment during the welding of the metal frame (that forms the facing) to the body of the component.

Fig. 5. A machined Nimonic frame ready for welding to the main body of the Avon thrust reverser box is here seen on the table of the Cincinnati machine employed for milling the arcuate inner surface

FIXTURE DESIGN

It will be appreciated, from a study of Fig. 2, that the component must be very carefully supported and clamped, in order to avoid distortion of the machined faces. At the lower end there is a machined flange, similar to that seen at *H* in Fig. 2, and the component is loaded so that the lower flange bears on a seating face on the upper member of the fixture base. Four hardened steel sector plates, as at *J* in Fig. 4, are screwed and dowelled to the seating face, and engage the periphery of the lower flange to locate the component on the fixture. The upper member is arranged to swing about a pivot that is eccentric to the common axis of the lower member of the fixture base and the rotary table of the machine. The arrangement is such that the upper member, and with it the work, can be indexed through 180 deg., to enable both facings on the component to be milled at the same set-up.

The component is secured by three sets of clamps, and these clamps include a large disc, seen at *K* in Fig. 3, which bears on the upper flange of the workpiece, and is thrust downwards by a nut and C-washer on a pillar that extends upwards from the fixture base, through the component. There are swan-neck clamps, as at *L*, which engage the lower flange of the workpiece, and pairs of strap clamps, as at *M* in Fig. 4, extend outwards from the interior of the component and bear on the metal behind the flanges. The latter clamps are positioned immediately over jack-screws, as at *N*, fitted to the fixture base upper member to support the component from below.

Mounted on the upper member of the fixture base there are castings over which the component is loaded. These castings are fitted with adjustable steady screws, set at suitable angles, which are advanced to contact the internal surfaces of the component, above and below the rectangular openings within the facings to be machined. The screws support the component against the thrust of the milling cutters. Each casting has a pair of pillars whereon can be mounted a cast bracket member, as at *P* in Fig. 3 and 4, which is introduced through the rectangular opening in the component. This bracket member carries steady screws, as at *R*, which bear against the inside of the welded-on frame, to provide further support. It may be observed that the screws only support the upper long side of the frame and the short side that is leading as the component is rotated for cutting, the trailing short side being unsupported.

As has already been mentioned, the facings are machined on frames which are welded to the main body of the thrust reverser box, and one such

frame is seen in the foreground in Fig. 5. Each frame is made from extruded Nimonic material, which is bent and welded to produce a plan-shape that is rectangular with rounded corners, and then formed to the required arcuate shape in elevation. The finish-machined frame is seen in Fig. 5 on the table of a Cincinnati Hydromatic horizontal bed-type milling machine, which is employed for the first operation in the machining sequence. At this stage, the inside face of the frame is profile milled to an arcuate shape, and the Cincinnati machine has been specially adapted to ensure maximum rigidity by Rolls-Royce, Ltd.

A massively-proportioned overarm has been fitted to the cutter head of the machine, which can move on vertical guideways of the column at one side of the bed. The overarm is indicated at *S*, and the end remote from the cutter head can slide in vertical rectangular-section guideways on a rigidly constructed outboard support bracket, which has been fitted to the bed of the machine by the company. This bracket is just visible at *T*. The machine has a hydro-copying valve *U* on the cutter head, and is fitted with a disc-type follower *V*, the diameter of which corresponds to that of the milling cutters employed. This follower engages the upper, profiled, edge of a template *W*, mounted on the table. The arrangements are such that as the machine table is traversed from right to left (as viewed from the front of the machine) the cutter head and overarm are moved to machine the inner face of the work to the required form.

A gang of five interlocking slab mills is employed, and the cutters are of 4¾ in. diameter, with teeth of 15 deg. helix angle, and arranged in in the gang with teeth of right- and left-hand helix alternately. The cutters are run at 24 r.p.m., and the table is advanced at a cutting feed rate of 1 in. per min. During the milling operation, soluble oil coolant is supplied from the pipe *X*. The minimum amount of metal is removed from the welded frame to clean up the inner face, and the total depth of cut is usually about 0·050 in.

MILLING FIXTURE DESIGN

The fixture employed to hold the frame during the profile milling operation, seen in the background in Fig. 5, is shown in Fig. 6 with the work removed. A heavy-section cast-iron base is machined to provide an arcuate seating face *Y*, whereon the outer surface of the component rests. At one end of the base there is a machined slot to receive hardened steel blocks, as at *Z*, which are screwed and dowelled in position. A screw (not visible in the illustration) at the opposite end of the fixture is employed to thrust the component into contact with the blocks, for endwise location.

Fig. 6. The fixture for holding the Nimonic frame during profile milling on the Cincinnati machine, which has been adapted by Rolls-Royce, Ltd.

Along the front of the fixture base there are five edge clamps, as at *A*, which are disposed at angles such that they are nominally tangential to the arcuate seating face. Each edge clamp can be adjusted radially by means of a screw, as at *B*, and it has two slots through which clamping studs pass. The edge clamps thrust the component transversely into contact with two fixed location pegs, one of which is seen at *C*. Between these pegs there are three adjustable steady screws, carried on pillars, and a row of five similar screws is provided at each side of the

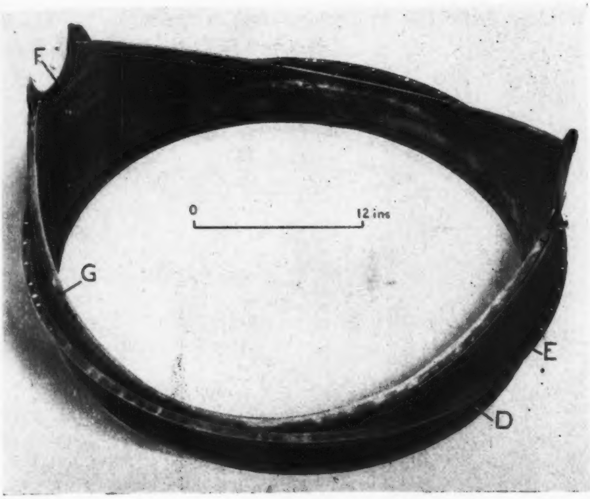


Fig. 7. A semi-finished rear seal for the thrust reverser fitted to the Rolls-Royce Conway by-pass gas turbine engine. The inclined eliptical flanges of this component are machined on the edge and lower surface

fixture base, within the work-seating. All these screws are advanced to contact the work and to steady it during cutting.

Following the profile milling of the inside face of the frame, the component is subjected to a series of other operations which include straddle milling the sides, profile milling the internal form, and machining the outer face on a vertical turning mill.

MACHINING THRUST REVERSER REAR SEAL

Fig. 7 shows a weld-fabricated Nimonic component known as a thrust reverser rear seal, for the Conway by-pass gas-turbine, of 17,500 lb. thrust. This component fits inside the thrust reverser box, and serves to connect it to the main jet outlet pipe. Corrugated cylindrical bellows, as indicated at *D*, are incorporated to allow for expansion, and the component is secured to the thrust reverser box by bolts which pass through the flange *E*. There is a similar mating component, known as a front seal, which fits in the thrust reverser box and connects with the outlet end of the engine. The principal difference between the front and the rear seals is that the former does not incorporate bellows. When the two components are assembled to the box, semi-circular seatings in each, as indicated at *F*, form housings for bearings that support swinging door assemblies, arranged one on each side of the thrust reverser unit. When the thrust reverser is brought into operation, these doors are swung inwards to close the main jet outlet pipe, and the flow of hot gases from the engine is then diverted through openings at opposite sides of the thrust reverser box, and thence through guide vanes that impart the required direction to the flow.

It will be observed that there are two inclined flanges, as at *G*, and the lower faces of these flanges must be machined to provide a seal, the included angle between them being held to 116 deg. 30 min. Moreover, the edges of the flanges must be machined for clearance purposes. Machining of the flanges is performed on a Webster & Bennett 5-ft. vertical turning and boring mill, which was built specially for Rolls-Royce with an extra high column to give greater clearance than normal between the table and the cross-rail. This machine is equipped with a fixture which is

Fig. 8. Setting up a Conway thrust reverser rear seal in preparation for machining the flanges on a Webster & Bennett vertical turning and boring mill, at the Rolls-Royce Derby works

Fig. 9. General view of the indexing fixture and cam-operated profiling unit built by Rolls-Royce, Ltd., for machining the flanges of thrust reverser seals

designed to secure and locate the rear seal under conditions similar to those prevailing in service. Each flange is machined in turn, with the component arranged so that the flange is horizontal. It will be appreciated that, since the body of the component is circular, the flange is of elliptical shape, and the turret of the Webster & Bennett machine is fitted with a special profiling slide, which was designed and built by Rolls-Royce, Ltd.

FIXTURE DESIGN

The fixture used on the vertical turning and boring mill is seen in Fig. 8, and the workpiece is indicated at *H*. Of angle-plate type, the fixture is mounted on the rotating table of the machine, and has a heavy cast base *J*, with a bearing surface machined at an angle of 31 deg. 45 min. to the seating face. This angle is equal to 90 deg. minus half of the included angle between the flange faces of the component. On the bearing surface is mounted a platen *K* which can be rotated, and located in two positions, 180 deg. apart, by an index plunger. After this plunger has been withdrawn by the associated lever *L*, the platen is turned with the aid of a tommy-bar inserted in holes spaced round the periphery.

More than one type of thrust reverser component is machined in the fixture, and interchangeable work-support elements are secured to the platen. For the Conway rear seal, these elements take the form of a support ring *M* and brackets, as at *N*. The upper face of the ring *M* is machined to receive the main securing flange of the component, which is located by dowels. Projecting from the ring are eight brackets carrying simple strap clamps, one of which is indicated at *P*, and these clamps bear on steel half-rings, as at *R*, which distribute the clamping pressure over the component flange.

At a previous operation stage, the bearing seatings (*F*, Fig. 7) at either side of the rear seal are machined on a Kearns horizontal boring machine. Trunnion blocks are fitted to the seatings when the component is loaded on to the Webster & Bennett machine, and each block has a main body of a diameter to fit the half-bearings at the upper ends of the brackets *N*, Fig. 8. On the inner end of each trunnion block there is a flange, as at *S*, and on the outer end there is an extension which is threaded for part of its length.

Each trunnion block is secured to the component by a clamp plate *T*, with an integral stud that passes through the block and is fitted with a nut and washer, which bear on the extension. A central recess and intersecting slot is machined in the clamp plate to provide clearance for the cutting tool in the profiling unit fitted to the machine turret. The trunnion blocks engage the half-bearings of the two brackets of the fixture, and are retained by hinged bearing caps, as at *U*, which are secured by eye-bolts and nuts. A collar *V* is provided on each trunnion block extension, and when the associated castellated ring-nut *W* is tightened on the thread at the end of the extension, the trunnion-block flange and the collar are closed on to the side faces of the half-bearing and cap, to secure the block axially.

Fig. 9 shows the fixture from the front, with the profiling unit in the operating position. Movement is imparted to the cutting tool *X* by a cam *Y*, fitted on a pillar that projects from the fixture base, so that the upper surface is horizontal. Surrounding the cam support pillar there are six smaller pillars, as at *Z*, which provide for mounting a setting plate, indicated at *A* in Fig. 8. The lower surface of an extension of the plate is finished to a specific distance from the seating face, and when the plate is mounted on a pillar, as shown, the

lower surface of the extension serves as a datum for machining the seal face of the associated flange on the workpiece. When the workpiece has been loaded and clamped, the machine operator places a parallel bar on the horizontal upper face of the cam, as seen at *B*. This bar serves to support a scribing block fitted with a dial indicator gauge, which is set to zero with the stylus point in contact with the datum face on the setting plate. The scribing block is then moved on the supporting bar to bring the stylus point into contact with the unmachined seal face of the flange, and the dial indicator gauge is read to determine the amount of metal to be removed—usually 0·010 to 0·030 in.

Machining of the flanges is performed in two stages, and for the roughing stage, the platen *K* is secured by clamps at each side, one of which is indicated at *C* in Fig. 9. After both flanges have been rough machined, the component is removed from the fixture, and is checked by the inspection department. It is then returned to the fixture, and reset for the removal of the required thickness of metal from each flange, as determined by the checking operation.

PROFILING UNIT

The profiling tool *X*, Fig. 9, is tipped with Wimet grade N carbide, and is used for machining both the lower face and inner edge of each flange. This tool is mounted in a holder *D* that is integral with a horizontal cylindrical ram, free to slide in the housing *E*. A keyway is cut in the bore of the housing, and is engaged by a key fitted to the ram to prevent the latter from turning. Rack teeth are cut in the ram and mesh with a pinion at the lower end of an inclined shaft. Drive is transmitted to the shaft from the handwheel *F*, through bevel pinions, and the tool can thus be fed radially. The housing *E* moves on a dovetail guideway machined on the block *G*, secured to one face of the machine turret.

Above the tool ram, the housing *E* is bored to form an air cylinder, which slides over a piston fixed to a bracket at one side of the block *G*. Air is delivered to one end of the cylinder during the machining operations so that the housing is urged to the left (as viewed in Fig. 8) and a roller-bearing follower is held in contact with the periphery of the profiling cam *Y*.

In order to provide increased rigidity, hardened steel strips have been added to either side of the block, and are engaged by pairs of rollers carried on brackets attached to the housing *E*. The rollers are provided with adjustable eccentric mountings and are set to ensure that there is no play between the housing and the guideway.

For machining the flanges, the table of the Webster & Bennett machine is run at 11 r.p.m. The machine turret is fed vertically downwards, at a rate of 0·006 in. per rev., for turning the inner edge of each flange. For facing the lower surface of each flange, the tool is fed radially by hand, at a rate of approximately 0·005 in. per rev.

PROFILE MILLING THE CONWAY NOZZLE BOX OUTER CASING

An outer casing for the nozzle box fitted to the Conway engine is seen in Fig. 10. This component is a stainless steel casting, and it will be observed that it is machined all over to leave a

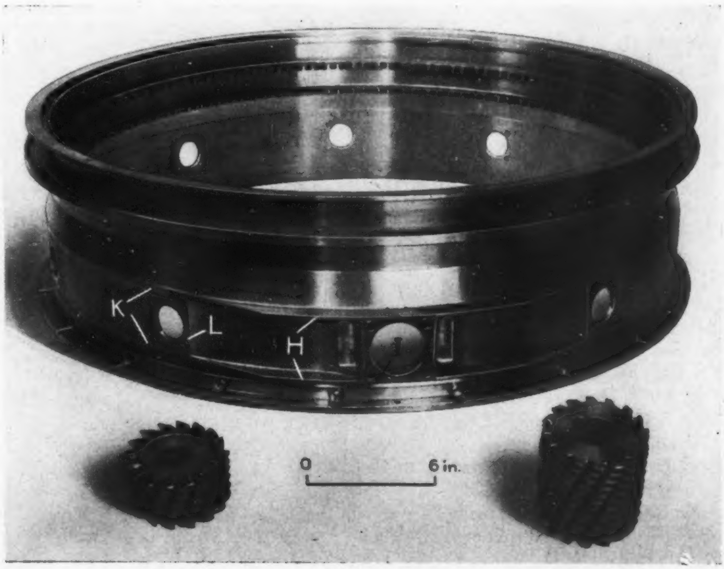


Fig. 10. A semi-finished nozzle box outer casing for a Conway gas turbine, with the Hydraspeed cutters employed for rough profiling operations

Fig. 11. Close-up view of the Hall & Pickles Hydraspeed heavy-duty milling cutter employed for the first roughing stage of the profile milling sequence on Conway nozzle boxes

thin shell, with various external and internal flanges, webs and pads. At one stage in the operation sequence, it is necessary to profile mill an annular portion on the exterior, to produce webs and pads, at positions 180 deg. apart, as indicated at *H* and *J*, respectively. Subsequently, pockets are milled at either side of each pad, as seen in the illustration, but the original profile-milled shape is clearly indicated on the lower webs.

Profile milling is performed in four stages, at one set-up, on a special Cincinnati Hydrotel machine. At the first stage, the full width of the annular portion is rough machined, using the Hall & Pickles Hydraspeed heavy-duty cutter seen at the right in Fig. 10. This cutter is of 5 in. diameter by 5 in. long, with 16 helical cutting edges, and has a continuous slow-helical groove, of knuckle form, in the periphery, so that each cutting edge is broken up into a series of teeth. Hydraspeed cutters were fully described in MACHINERY, 94/670—25/3/59, and the roughing cutter is seen in use in Fig. 11. High rates of metal removal are achieved due to the multiple single-point cutting action, and swarf clearance is facilitated because the chips produced are small. Conventional milling is used for this roughing stage, with the cutter running at 24 r.p.m., and the work is rotated to provide a feed rate of 1¼ in. per min. About 0·050 in. of metal (a side) is left on the work for removal at the finishing stage.

Following this stage, a second roughing operation is performed to remove the excess material between the webs *H*, Fig. 10, 0·050 in. (a side) being again left for finishing. The cutter for this stage is seen at the left in the illustration, and is of Hydraspeed type, with cutting teeth at each end. Of 5-in. diameter, this cutter also is run at 24 r.p.m., and the feed rate is 1¼ in. per min.

With these roughing stages completed, and the work still mounted on the Cincinnati machine, two finishing operations are performed. At the first, the annular portion is straddle milled to finished form, and witness marks of the straddle milling cut can be seen at *K* in Fig. 10. Climb milling is employed, and the two 5-in. diameter cutters are run at 51 r.p.m., the feed rate being 1¼ in. per min. The second finishing stage provides for removal of the excess material between the straddle milling cuts to produce facings, as at *L*, and the webs and pads, as at *H* and *J*, respectively. Conventional milling is employed for this operation, which is performed by two 5-in. diameter cutters, run at 24 r.p.m.

SPECIAL CINCINNATI HYDROTEL MACHINE

Fig. 12 is a general view of the Cincinnati Hydrotel machine with the first roughing operation on the nozzle box in progress. This machine was specially built to Rolls-Royce specification, and has a work-table *M* and a master-table *N*, both of 42 in. diameter. These tables are connected by a train of three gears, so that they rotate in phase. Drive to the table is taken through a standard Cincinnati Hydramech unit, as fitted to HyPowermatic machines and described in MACHINERY, 98/831—12/4/61. This unit transmits drive from a hydraulic motor to a gear below the table, and provides for the elimination of backlash.

A 15-h.p. motor is provided for the cutter head *P*, and the spindle speed can be varied from 15 to 600 r.p.m. by means of change gears. The cutter spindle has a standard 5-in. diameter nose, with 1-in. keys, and the complete cutter head assembly is built into a ram casting which can be traversed on horizontal slideways by hydraulic power. Dovetail guideways are provided at the front of the ram to carry an arbor support bracket *R*. The cutter spindle is mounted in a quill that has limited adjustment for height, and the work is mounted on packing blocks, as at S, which were made by Rolls-Royce, Ltd.

Movement of the ram and cutter head, radially to the work, is controlled by the tracer valve assembly *T*. This unit is mounted on compound dovetail slideways on one side of the ram, and is adjustable vertically and transversely, relative to the master on the table *N*. The tracing control system is of standard Cincinnati type, and the disc type follower *U* is of the same diameter as the cutter. Since the follower is relatively thin, the height of the master *V* is very much less than that of the work. Grooves are machined in the periphery of the master to correspond with the various profiles to be produced on the component. The height of the follower can be readily adjusted to engage it with the required groove in the master.

Pressure oil for the table and ram motions is supplied by a pump with an output of 10 gal. per min. at a pressure of 500 lb. per sq. in. To power the main cutter spindle clutch and brake unit, the clamping arrangements for the spindle quill, the hydraulic pilot valve, and the backlash eliminating system, oil is taken from the main supply and passed through a valve which reduces the pressure to 150 lb. per sq. in. All motions of the machine can be controlled from the push-button panel at the side of the master table.

The machine has provision for varying the rotary speed of the work, so that the feed rate is kept constant, although the diameter machined may range from 16 to 48 in. A cam plate is mounted on the side of the machine base, below the ram, and is seen in the close-up view in Fig. 13. This cam plate can be adjusted longitudinally to suit the diameter of the cutter employed from 0 to 10 in., and a scale, engraved on the plate, is calibrated in ¼-in. units with every 1-in. graduation extended, and every other 1-in. graduation numbered. This scale is read with reference to an index mark on the bracket *W*. A track machined in the plate is engaged by a follower roller on the inside of the block *X*. This block is mounted on the end of ground cylindrical guide-members, which

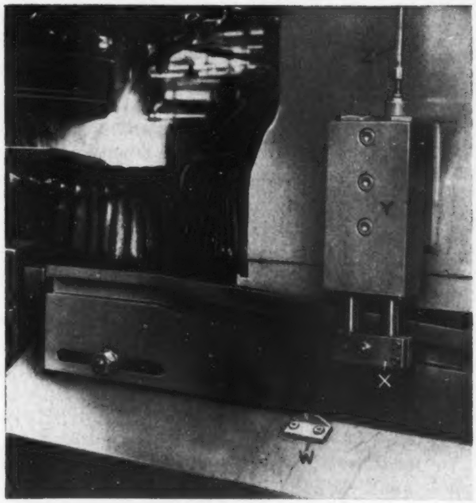


Fig. 13. The cam on the machine bed, and the follower on the cutter head ram of the specially built Cincinnati Hydrotel milling machine, which control the speed of rotation of the work-table, to maintain a constant feed rate, regardless of the radius at which cutting is being performed

Fig. 12. General view of the set-up for profile milling Conway nozzle boxes on a Cincinnati Hydrotel milling machine which was specially built to Rolls-Royce specification

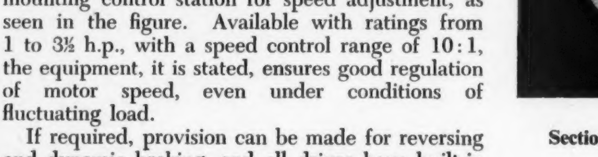
can slide in the support *Y*, secured to the ram carrying the cutter head. As the ram is moved relative to the work, the follower roller is raised or lowered by the cam track and this motion is transmitted by a Bowden-type cable to an auxiliary flow control valve on the tracer-head assembly. This valves provides for an additional flow of oil to the table drive hydraulic motor as the cutter advances towards the centre of the work, to increase the speed of rotation.

A further article concerned with the Aero Engine Division of Rolls-Royce, Ltd., will be published shortly in MACHINERY.

Series BMC.1 Adjustable Speed Drive

An adjustable speed drive, which can be supplied with a wide range of control characteristics, has been introduced by Lancashire Dynamo Electronic Products, Ltd. Known as the series BMC.1, the drive comprises a motor and remote mounting control station for speed adjustment, as seen in the figure. Available with ratings from 1 to 3½ h.p., with a speed control range of 10:1, the equipment, it is stated, ensures good regulation of motor speed, even under conditions of fluctuating load.

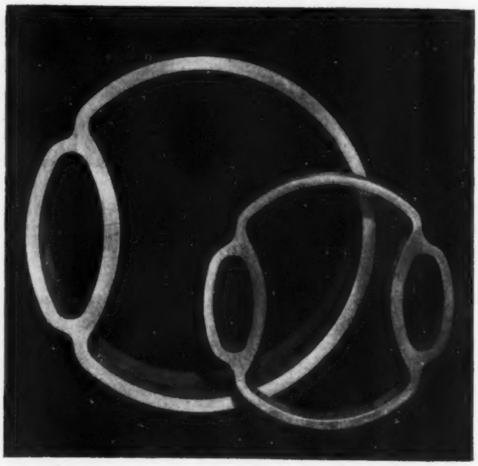
If required, provision can be made for reversing and dynamic braking, and all drives have built-in current limit protection against overloads of the motors of control equipment. Motors can be supplied with various enclosures and a wide range of basic speeds.



Lancashire Dynamo series BMC.1 adjustable speed drive

Unitrace and Duotrace Aluminium Alloy Tubes

Imperial Aluminium Co., Ltd., Kynoch Works, Witton, Birmingham, are now marketing the Unitrace and Duotrace extruded aluminium-alloy tube



Sections of Alcoa Unitrace and Duotrace aluminium-alloy tubes

manufactured by the Aluminium Co. of America. Of the cross sections shown in the figure, these tubes are designed for use in the processing of chemical and food products where liquids must be kept warm to prevent solidification when being pumped from one point to another. They are equally eflective, it is stated, where liquids must be kept cool at a controlled temperature. The product is carried by the large bore, and the heating or cooling medium by the small trace bore.

These tubes are available in 30 ft. lengths and in sizes from 1 to 8 in. diameter. They are light in weight and are easily bent, but have considerable strength, and the integral construction ensures good thermal characteristics.

Special flange fittings enable lengths of tube to be bolted together with standard flanges, or to jacketed fittings by means of adapter flanges.

Planning for the AEI Numeritrol Numerical Control System

By A. W. ASTROP, Associate Editor

THE NUMERITROL NUMERICAL CONTROL SYSTEM for machine tools, which was developed by the Electronics Apparatus Divison of Associated Electrical Industries, Ltd., Leicester, is of the magnetic tape type, and was described in MACHINERY, 99/77—12/7/61, where reference was also made to its application to a Newall type 1520 CC jig boring and milling machine. Before discussing the planning and programming procedures associated with the system, it may be useful to recall, however, that digital information recorded on the tape is used to transmit signals to servo-mechanisms for the three main machine motions, namely, longitudinal, transverse and vertical, also for the control of auxiliary machine functions. For each of the main movements there is a separate Helixyn unit whereby the actual displacements of the slides are continuously monitored and measured, relative to a datum point, which may be chosen anywhere within the limits of the machine movements during the initial setting-up of a workpiece blank, and this information is fed back to a control unit. The arrangement is such that the servo systems seek continually to equate the demanded and actual positions of each slide, and will move the latter until the two signals coincide.

From the receipt of a working drawing of a given component to the loading of a suitably-recorded tape into the controller, four basic stages must be completed. Stage 1 involves filling in special planning sheets with the relevant dimensional and ancillary information, from which a punched paper tape (Stage 2) is prepared on a teleprinter machine. Alternatively, this tape can be prepared at the AEI Service Centre, Leicester, from information supplied by the machine user. Simultaneously with the punching of this tape (which is identified as tape *A*), the teleprinter produces a typed copy of the data, which can be used for checking purposes. Tape *A* is then despatched to the AEI Tape Service Centre at New Parks, Leicester, where it is fed through a general-purpose computer. The data on tape *A* is of a basic nature, and defines the periphery of the workpiece in terms of change points in the directions of movement of the cutter, and the general purpose computer converts this positional information into terms of points on the path to be followed by the centre of the cutter, in order to facilitate the next stage in the computing procedure. These data are in the form of a second punched-paper tape—identified as tape *B*—which is then fed to a special-purpose computer. Known as the "Director," this computer transfers the data on tape *B* to a 4-track magnetic tape, in the form

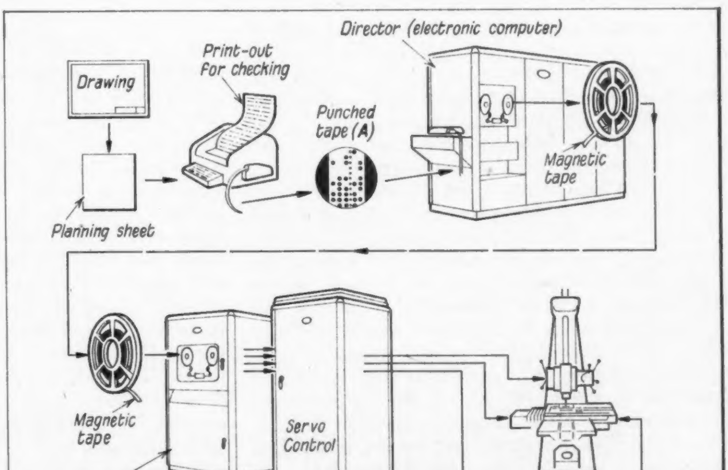


Fig. 1. Diagrammatic representation of the various stages in producing a magnetic tape for a machine under AEI Numeritrol control

of digital recordings, and it is this latter tape which is subsequently used to control the machine tool. The Director provides an effectively continuous interpolation between the basic data carried by the tape *B*.

A full reel of standard-thickness magnetic tape provides for approximately 1 hour of continuous machining, and it is stated that the maximum time required by the Tape Service Centre from the receipt of a tape *A* to the despatch of a magnetic tape is 3 days, although in many instances this period can be reduced considerably. The complete procedure described above is illustrated diagrammatically in the line drawing Fig. 1, which is largely self-explanatory. It should be mentioned, however, that the intermediate stage for the production of the tape *B* from the tape *A* has been omitted from this drawing, for the purposes of simplification, since it does not directly involve the machine user, who is concerned ultimately only with the magnetic tape.

PLANNING CONVENTIONS

It is the responsibility of the planning engineer to determine the path which the tool is required to take for any given workpiece, also to divide this path into a series of steps. Each step comprises either a line, an arc of a circle, a pause, or a stop. In defining the path which the tool is to take, the planner can use either the co-ordinates of the tool centre, or the co-ordinates of the workpiece, whichever is most convenient, although if the latter are adopted he must specify the diameter of the cutter which is to be employed. A number of steps of the types mentioned above constitutes a complete programme, and a complete machining operation for any given part consists of one or more programmes.

From the standpoint of the working drawing, it is preferred that dimensions in the *X* axis should originate from the left-hand side, and increase progressively towards the right; dimensions in the *Y* axis should originate from the bottom of the drawing and increase progressively towards the top; and dimensions in the Z axis should originate from above the workpiece and increase progressively downwards. It is also preferable that datum points should be clear of the extremities of the workpiece. Each dimension is prefixed by a sign on the planning sheet, and for the method of dimensioning indicated the signs are positive.

ABREVIATIONS AND SYMBOLS

To facilitate planning, a number of abbreviations and symbols has been established. For example, there is a number of symbols under the general heading of "Instruction Digits," which relate to non-dimensional information. The first group of these digits includes 0, representing movement in the Z axis only; 1, which means that the next shape to be cut is a straight line; and 2, 3, and 4, which represent the shapes, minor arc, semi-circle, and major arc, respectively. A minor arc subtends an angle of less than 180 deg., and a major arc subtends more than 180 deg.

In group 2 there are two symbols only, namely, 10 and 20, which signify that cutting is to take place on the right-hand side or the left-hand side of the tool, respectively. These digits can be added to any of those in the first group, as required. There are five different symbols in the third group, namely, 70, which is an instruction to set the X, Y and Z datums; and 31 and 41, denoting the last and first in a sequence of tool centre steps. The symbols 31 and 41 indicate "entering" and "leaving" a section of the programme in which the co-ordinates quoted refer to the *profile* of the workpiece. Otherwise, co-ordinates refer to tool-centre positions, as when drilling, picking up

MACHINE DATA CARD			
FIRM			
MAKE OF M/C.			
CONTROLLER	TYPE		SERIAL No.
CONTROL ELEMENT			LEAD
SPINDLE	H.P.		ROTATION
	SPEEDS		
TABLE SIZE	X		Y
TABLE OVERHANG	X		Y
OVERALL Z MOTION			
TEE SLOTS	WIDTH		
MOVING MEMBER	X	Y	Z
LIMITS OF CONTROLLED MOTION	X	Y	Z
SENSE OF SCALES	X POS. NEG.	Y POS. NEG.	Z POS. NEG.
GEAR	X F.T.	Y F.T.	Z F.T.
MAX. FEED MAX. ACCELERATION			
MAX. ERROR FACTOR ALLOWED ACCELERATION	X	Y	Z
SERVO TIME CONSTANTS	X	Y	Z
AUXILIARY INSTRUCTIONS	CODE	INSTRUCTIONS	
	3		
	4		
	5		
	6		
	7		
	8		
	9		
		SIG.	DATE

Fig. 2. Reproduction of a typical Machine Data Card. One of these cards is required by the planning engineer for each machine which is equipped with Numeritrol control

reference holes, etc. Finally, symbols 6 and 7 are employed for optional and compulsory stops, respectively. An optional stop is one which the control system will obey only if the operator has set an associated switch, otherwise it will be ignored. Such stops are included by the planner at his discretion, when it is thought that it may be useful for the operator to inspect the workpiece or the tool at any given stage of the machining, for example. Compulsory stops are inserted at stages where it is necessary to change tools, for instance.

Mention may be made here of pauses, or momentary halts, which are required in the machine motions immediately prior to an abrupt change in direction of the cutter path. Provision is made for such pauses at the planning stage by inserting a minus sign in front of the Instruction Digit of the step after which the halt is required. Provision can be made for a maximum of seven different auxiliary instructions for the machine tool, such as turning coolant on and off, by means of a group of decimal-type digits. Examples are ·004, ·040 and ·200, and these digits are inserted immediately after the appropriate Instruction Digit, being separated from it by the decimal point. If combined instructions for a number of auxiliary functions to be performed simultaneously are to be given, the appropriate decimal-type digits are added together, the values having been selected such that any given total can represent only one particular combination.

The auxiliary functions represented by each of the decimal-type digits are constant for any given machine tool, and are recorded, among other permanent information, on a Machine Data Card. One of these cards is made out for each machine tool which is under Numeritrol control, and provides all the relevant basic information about that machine which the planner requires before planning starts. A typical card is shown in Fig. 2, and is largely self-explanatory. Information is given concerning the maximum movements of the machine in the X, Y, and Z axes, number of T-slots, pitch of T-slots, spindle speeds, horsepower, etc. The heading "Sense of Scales," approximately half-way down the card, refers to the scales which are incorporated as part of the measuring equipment of the machine, and the direction in which they read relative to motion in the X, Y and Z axes.

Maximum acceleration and allowed acceleration are values which are determined as a result of tests to establish the responsiveness of the servo-system of the machine, and the values inserted are peculiar to that machine only. At the bottom of the card, provision is made for allocating the various auxiliary functions of the machine to the numbers between 3 and 9.

Another non-dimensional convention in planning procedure relates to the machining of circular arcs, in that convex and concave shapes are identified by prefixing the relevant radius with a plus or a minus sign, respectively. Finally, mention may be made of certain restrictions which the planner must bear in mind when setting out the data for a workpiece. An external sharp corner must not follow the last step in a tool centre sequence (digits 31, see above), nor precede the first step in a tool centre sequence (digits 41, see above). At the start of a (31) step and at the end of a (41) step, the cutter must clear the workpiece in the X and Y axes by at least 0·040 in.

From a dimensional standpoint, the planner is obviously restricted in the X, Y, and Z axes to the maximum slide movements of the machine. Finally, radii on workpieces are restricted to a maximum of 1,700,000 in., and internal radii to a minimum of (cutter radius + 0·001 in.).

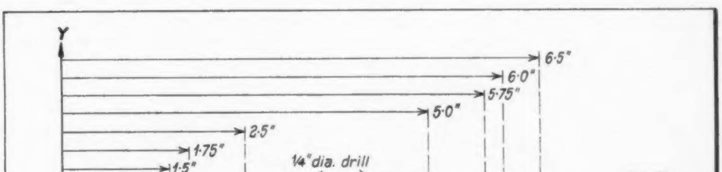


Fig. 3. Typical workpiece showing the recommended method of setting out co-ordinate dimensions

AN EXERCISE IN PLANNING FOR A TYPICAL WORKPIECE

In Fig. 3 is shown a sample workpiece—an arcuate clamping member with a stepped cross-section—which will serve as an example to demonstrate a typical planning sequence. When brought to the Numeritrol-controlled machine, the blank already incorporates the ¼-in. diameter drilled hole S which is to serve as a workpiece datum. It will be noted that the dimensional datum point is located beyond the periphery of the workpiece, and that the layout of dimensions conforms to the convention stated above.

It is assumed that the workpiece will be mounted on spacing blocks and will be clamped by bolts which pass through services holes in the blank (not shown) and engage with T-nuts in the work-table. Attention is now drawn to Fig. 4 where the complete planning sheet for this workpiece is reproduced.

The function of each instruction included on the planning sheet is noted briefly in the section at the right, headed "Notes," to facilitate identification of the sequence step by step. Step 1 provides for setting the machine spindle relative to the hole S, Fig. 3, and the X and Y co-ordinates for this hole are written in their respective columns—namely, 2·5 and 2. A zero value for the Z datum will suffice where it is required (as in Step 5) and a zero is therefore written in the appropriate column. At the machine, the spindle is aligned with the hole S by the operator, who inserts a centring gauge in the spindle and moves the work-table under hand control. Having aligned the spindle in this manner, the operator then "zeros" the X and Y Helixyns, and the control system is thus set relative to the datum hole S. Instruction to the operator for this procedure, also for setting the machine in the Z axis, changing cutters, and any other similar information, is set out on a Machining Instruction Sheet which is compiled by the planner, and to which further reference will be made later.

It will be noted that Step 1 also includes the digits 70, in the column headed Instruction, which is the code for "set X, Y and Z starting points." Steps 2 and 3 are connected, in that they form what is termed the starting sequence, namely, the

Ø —— CRLFλJØ2.OCRLF (Title) CLAMP

n.....24.....(date)..................CRLFØØØ ——— CRLF

Step	Instruct.	X or Tool dia	Y	R	Z	Z Feed	* → XY Feed	Accel.	Notes	Stop No.
1	70	2·5	2		0		10	0·1	Starting position at hole S	
2	5	4							Pause stop - 4 sec } Starting sequence	
3	7									CS1
4	1	0·0424	0·0544						Move to point L	
5	7								Put in ¼" drill set Z datum to spacing block	CS2
	Ø—CRLF									
6	1	5	2		-0·512	10				
7	0				0·2	1			Drill hole T	
8	0				-0·512	10				
9	1	0·0424	0·0544		-0·6142	0			Move to point L	
10	7	1·0							Put in 1" cutter	CS3
	Ø—CRLF									
11	31	1·75	0·701						Move to point A	
12	11	1	2				2		Edge AD	
13	2								External corner at D	
14	2	6·5	0 *	5·5					Edge DC	
15									External corner at C	
	Ø—CRLF									
16	1	5·76	0·701						Edge CB	
17	2								External corner at B	
18	2	1·75	0 *	-4					Edge BA	
19	41	4·136	0·0544						Move to M	
20	6								Optional stop at M	OS1
	Ø—CRLF									
21	31	6	1·134		-0·25	10			Move to E	
22	-12	1·5	0 *	-4·5			2		Edge EF	
23	41	0·0424	0·0544				10		Move to point L	
24	0				0	10				
25	7									CS4
	Ø—CRLF * λ END									
	N.B. Terminate each line with = CRLF									

Prog. Ser. No. n 24
Prog. 1 of 1
Sheet 1 of 1
NEWALL 15/20
Machine
Workpiece: CLAMP
NOTE: Finishing cut made by repeating CS3 to CS5
Job No.
Customer
Drawing
Sketch
Initials
Date
AEI NUMERITROL
Planning Sheet

Fig. 4. The planning sheet for the workpiece shown in Fig. 3 is here reproduced in entirety

Table of Grid Points for a Helixyn of 0.1024-in. pitch.										
0	0	1	2	3	4	5	6	7	8	9
0	0	0.1024	0.2048	0.3072	0.4096	0.5120	0.6144	0.7168	0.8192	0.9216
10	1.0240	1.1264	1.2288	1.3312	1.4336	1.5360	1.6384	1.7408	1.8432	1.9456
20	2.0480	2.1504	2.2528	2.3552	2.4576	2.5600	2.6624	2.7648		
30	3.0720	3.1744	3.2768	3.3792	3.4816					
40	4.0960	4.1984	4.3008							
50	5.1200	5.2224	5.3248							
60	6.1440	6.2464	6.3488							

Fig. 5. Portion of the table of zero points which is supplied by A.E.I., Ltd., to facilitate locating the grid points of the Helixyn measuring system

point at which the machine first comes under complete tape control. Steps 2 and 3 provide a "pause" of 4 sec., followed by a stop, during which the operator locates the starting point on the magnetic tape.

Step 4 it will be noted provides for a "move to *L*" (see insertion in column headed Notes). This move brings the machine spindle to a convenient position for setting the height of the tool. The position *L* is shown by crossed lines in Fig. 3. For convenience, this arbitrary point is chosen to be a "grid point," as it is termed. As described in the previous article on the Numeritrol control system, the actual displacement of each machine slide is monitored continuously by means of a Helixyn unit which is a bar incorporating helically-wound conductors. Embracing, and clear of this bar, there is a sleeve, the bore of which is also provided with helically-wound conductors. Electrical pulses are transmitted to the sleeve and as a result of the capacitive coupling between this member and the bar, signals are induced in the latter and are fed to the servo-control system The signals are of cyclic nature, and recur at 0·1024 in. intervals, in terms of travel of the sleeve.

Considering the Helixyn units for the X and Y axes, therefore, an imaginary grid can be visualized, composed of a number of 0·1024-in. squares, the long side of the grid being equal to the length of the X axis Helixyn, and the short side to the length of the Y axis Helixyn. The point *L* is located with the aid of a Table of Grid Points which is provided by A.E.I., Ltd., for the use of the planner. A portion of this table is reproduced in Fig. 5, and it sets out the values of the expression $n \times 0{\cdot}1024$, where n is any whole number from 1 to 200.

For the workpiece shown in Fig. 3, the grid point *L* is located in the following manner. The workpiece datum (hole S) is 2·5 in the *X* axis from the dimension datum 0. From the table of grid points, Fig. 5, it will be seen that the nearest figure to 2·5 is 2·4576, and that the nearest figure to 2·0 (the position of the hole S in the Y axis) is 1·9456. By subtracting the grid values from the drawing values (namely, 2·5 − 2·4576 and 2·0 − 1·9456) the position of the grid point *L* in the X axis becomes 0·0424, and in the Y axis 0·0544, and these figures are inserted in the appropriate columns for Step 4. It may be mentioned, however, that there is no necessity to select the grid point which is nearest to the datum 0. As stated above, its position is purely arbitrary, and is selected entirely for convenience, bearing in mind the design of the work-holding fixture, for example, and the position at which a height gauging block can most easily be accommodated. The Instruction for Step 4 is the code digit 1, which it may be recalled represents a straight line movement.

It will be noted that between Steps 4 and 5, the Planning Sheet is overprinted with the combination ϕ-CRLF, which is an instruction to the teleprinter operator to operate the Blank Tape Run Out, followed by Carriage Return, Line Feed. This instruction appears after every five steps in the planning sequence and consequently provides for "separation" of the data on the punched tape, at regular intervals. With this arrangement, location of any specific instruction on the tape is greatly facilitated.

Step 5 is a Compulsory Stop (code 7 in the Instruction column) since the operator is required to insert a ¼-in. diameter drill in the spindle in readiness for machining the hole *T*, Fig. 3. At the same time, the operator will lower the spindle by hand until the drill point touches the top of one of the spacing blocks on which the workpiece is mounted, thereby establishing the Z datum. Finally, he nulls the Z axis Helixyn.

MAGNETIC TAPE			OPERATIONS	STOP	FEET	POSITION OF M/C MOVEMENTS			LOCATE		CUTTER	SPINDLE SPEED	ROUGHING CUT	NOTES
PROGRAM SERIAL No	SEQUENCE LETTER	REEL No				X	Y	Z	STOP	FEET				
n24	A	36		—	—	2·5	2·0	—	A/CS1	005				1
				A/CS2	023	0·0424	0·0544	—	—	—	1	600		2
			Drill hole T	A/CS3	081	"	"	0·6144	—	—	2	1200	0·010	2
			Mill edge ADCBA } Roughing	A/OS4	638	4·1360	"	0	—	—	"	"		
			" " EF } cut	A/CS5	675	0·0424	"	"	A/CS3	081	"	"		3
			Finishing cut {	A/OS4	638	4·1360	"	"			"	"		
			{	A/CS5	675	0·0424	"	"			"	"		

PROG. n 24

MACHINE NEWALL 15/20

WORKPIECE CLAMP

CUTTER DETAILS		
No	TYPE	NOM. DIAM.
1	Drill	1/4"
2	Slot Drill	1"

JOB No. 123

MATERIAL

CUSTOMER

DRAWING

SKETCH

INITIALS | DATE

NOTE		NOTE	
1	Locate centre hole S. Null out X and Y helixyns. Raise in Z by hand to clear workpiece.		
2	Set tool to top surface of spacing block. Null out Z.		
3	Measure workpiece and put in appropriate tool radius compensation.		

A.E.I. NUMERITROL.

MACHINING INSTRUCTION SHEET

Fig. 6. This Machining Instruction Sheet is made out by the planner and incorporates all the information required by the machine operator for producing the workpiece seen in Fig. 3

Step 6 provides for moving the spindle to the required position for drilling the whole *T*, the code 1 in the Instruction column indicating a straight line movement, and the X and Y ordinates appearing in the appropriate columns. While the table is moving to the required position, the spindle is also being raised, rapidly, so that the drill point clears the edge of the workpiece. A high feed rate is therefore specified for the spindle traverse (10 in. per min. in the Z feed column), but is restricted to not more than 32 times the XY feed rate. Column Z, for Step 6, shows an entry of 0·512, which is the nearest grid point to 0·5 in. from the Z datum, in other words, the top face of the workpiece, and provides for the spindle to be stopped with the drill point 0·012 in. clear of the work.

Steps 7 and 8 provide for drilling the hole *T* at a feed rate of 1 in. per min., the drill being fed down until the point is 0·2 in. below the bottom of the workpiece, and returning the spindle (at 10 in. per min. feed rate) to its starting position. It should be noted that Steps 7 and 8 call for movement in the Z axis only, and that the code digit 0 is therefore inserted in the Instruction column. After the hole *T* has been drilled, Step 9 provides for returning the spindle of the machine to the position *L*, Fig. 3, preparatory to milling the periphery of the work.

The remaining stages in the planning are largely self-explanatory, and reference will be made only to items of particular importance or interest. The identification letters included in the section of the Planning Sheet headed Planner's Notes refer to change points on the workpiece, and correspond to those shown in Fig. 3. The Instruction for Step 11 is 31, which denotes a "last tool centre step," and the system automatically arranges for a momentary halt in connection with this Instruction (also 41). The code digits 2 which appear in the Instruction column for Steps 13 and 14 indicate that minor arcs are to be cut.

Attention is drawn to the entries in the X, Y, and R, columns for Step 14. This step provides for milling the convex curve *DC*, Fig. 3, and the information required comprises only the X axis ordinate for the point *C* and the radius of the curve, namely, 5·5 in. The ordinates for *D* were inserted at Step 12, and O* is entered in the appropriate

column. (The suffix* denotes that this step is an increment.)

For the same reason, an asterisk is included after the O in the Y axis column for step 18. Since this curve is concave, the value of the workpiece radius in the fourth column is prefixed by a minus sign.

Finally, it will be noted that at Step 20 there is provision for an Optional Stop (code digit 6). This stop follows a move by the spindle to the position *M*, Fig. 3, immediately after the curve *BC* has been machined. At this stage, the periphery of the workpiece has been completely machined, and the operator may wish to inspect the finish, also the condition of the cutter, before proceeding to mill the stepped portion *EF*. The position *M* is a grid point, selected conveniently clear of the workpiece, and is represented by the entries in the X and Y columns for Step 19. Information regarding movement of the spindle in the Z axis to cut the step EF to the required depth is included in the appropriate column for Step 21.

Mention has already been made of a Machining Instruction Sheet which is made out by the planner and is issued to the machine operator for guidance. The Machining Instruction Sheet for the workpiece in Fig. 3 is shown in Fig. 6, and contains all the information required by the operator, including the tape footage relating to each stop point, so that the tape can readily be rewound to a specified position, for replay for example.

Small Stainless Steel Camera Components Produced by Powder Metallurgy

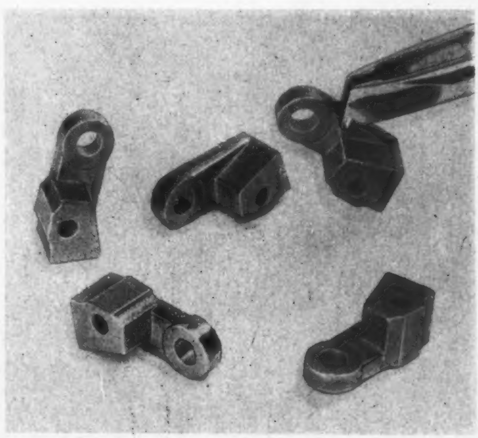
Until recently, difficulty has often been experienced in sintering parts made from stainless steel powders because of their low green strength. Improved powder metallurgy techniques have, however, been developed by the firm of Dixon Sintaloy Inc., Connecticut, U.S.A., which are stated to permit the economical production of components from A.I.S.I. type 316 stainless steel as well as stainless steels in the 300 and 400 series.

Where intricate shapes are involved, and resistance to corrosion is important, fabrication from stainless steel powders offers considerable advantages. Other metal powders, which are easier to process, may be used in some instances, but for corrosion resistance it is then usually necessary to rely on a secondary operation, such as sealing or electro-plating.

Sintered stainless steel has proved suitable for components for sports equipment exposed to the weather, bearings, cams, gear trains for water meters, and parts for food-vending machines, medical equipment, and cameras. Among the latter are components known as "jammers," as shown in the accompanying illustration, which are employed for locking in position the lens and shutter unit of a Polaroid electric-eye camera.

The decision to produce these items by powder metallurgy was taken after difficulty had been experienced in machining the rather complicated shape to the close tolerances specified. These parts, of which there are right- and left-hand forms, are less than ¾ in. long.

A die with only two impressions is employed which produces one left-hand and one right-hand part, and complete interchangeability is thus ensured. After sintering, a final coining operation is performed to size the part, the limits on the thickness of the pad portion, for example, are $\pm 0{\cdot}001$ in. The bearing holes must be accurately square to the flat surfaces, and when a pair of parts is assembled in the camera, the holes must be concentric within 0·002 in. total indicator reading. These components, which are stated to be among the smallest produced in stainless steel by the company, are being made in large numbers.



Small components for cameras produced from stainless steel powder by means of improved techniques developed by Dixon Sintaloy Inc. U.S.A. Less than ¾ in. long, these parts are employed for locking the lens and shutter unit of a Polaroid electric eye camera

The Activities of Paterex, Ltd.

By G. W. MASON, Associate Editor

PATEREX, LTD., recently vacated their premises at Kidbrooke Park Road, London, S.E.3, and have occupied an entirely new factory at Cray Avenue, St. Mary Cray, Orpington, Kent.

The company is engaged in the quantity production, on a contract basis, of a wide range of components from steel bar. Many of these components are intended for aircraft and gas turbines, and are made to close dimensional tolerances, and with a high surface finish, from Nimonic and heat resisting steel. Some 250 people are employed at the new factory, which has a floor area of 35,000 sq. ft.

At the Cray Avenue works, the production equipment available includes a total of 105 single-spindle automatics with bar capacities up to 1½ in., 40 capstan lathes, 10 centreless grinders, and two thread rolling machines. In addition there is a Cri-Dan high-speed automatic screwcutting lathe and a thread milling machine, also cylindrical grinders, bench-mounted centre lathes, small-capacity milling machines, and drilling machines, on which second operations are carried out on certain components.

These machines are housed in a single well-lit shop, at the sides of which there are separate departments for inspection, barrel finishing of workpieces, storing of considerable quantities of steel bar, and separating cutting oil and swarf. Some of the automatics may be seen in Fig. 1, which gives a view of part of the shop. About 45 people are normally employed for the inspection of completed workpieces, which is carried out on a 100 per cent basis, in most instances to A.I.D. requirements.

Whereas certain components are made by Paterex, Ltd., in fairly small numbers, others are produced in considerable quantities, and the volume of orders handled by the company is such that the automatics, and most of the second-operation machines are maintained in continuous production. Work has already been started on the construction of extensions to the factory, which, when completed, will provide an additional 6,000 sq. ft. of manufacturing space.

Fig. 2 is a close-up view of a Scrivener No. 1 centreless grinder, fitted with a roll crushing attachment A, which has been made by the company for dressing multiple ribs of radiused form on the grinding and control wheels, as required for plunge grinding brass roller comb components for electric shavers. For dressing, the crushing roll is brought between the grinding and control wheels by movement of the arm on which it is mounted through 180 deg. from the position shown. The control wheel is then run at a higher speed than is employed for grinding, which is engaged by movement of a lever on the 2-speed motor driving unit mounted on the head. During the dressing operation, the grind-

Fig. 1. In this view may be seen some of the single-spindle automatics installed at the new St. Mary Cray works of Paterex, Ltd.

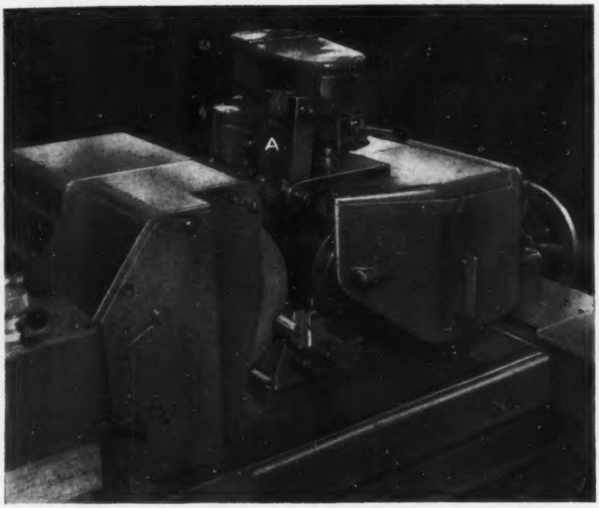


Fig. 2. Close-up view of a Scrivener No. 1 centreless machine fitted with a roll crushing attachment and set up for grinding roller comb components for electric shavers

ing wheel is turned by the action of the crushing roll. This machine, and others of similar type installed at the St. Mary Cray works, is fitted with an air-operated workpiece ejector, of the company's design, which is brought into use by means of an air valve. This valve is actuated by the sliding-type cam for controlling the traversing movement of the control wheel-head, when the latter is being moved in a direction away from the grinding wheel at the end of the working cycle.

Special nuts for the aircraft industry are produced in large numbers, and Fig. 3 is a close-up view of a machine, with certain covers removed, which has been built by the company for chamfering the bores in blanks at both ends prior to tapping. Blanks are loaded into the centre-board type hopper *B*, and are delivered by way of chutes at both sides into radially-extending slots at the peripheries of two indexing carriers. Drive from the motor is taken by a belt to the transverse shaft *C*, and thence by spiral gears to the shafts *D*. From these shafts, the individual cutter spindles are driven through Tufnol gears. The spindles in each pair can be adjusted independently for depth of cut, and are off-set so that, during the working cycle, countersinking is carried out simultaneously at the rear end of a blank at one position in the carrier, and at the opposite end of another blank at the next position.

A worm at the centre of the shaft *C* is in mesh with a wormwheel, which, through the shaft *E*, drives a Geneva mechanism for indexing the work carriers, also a crank for imparting reciprocating motion to the centre board in the hopper *B*. Feed is applied to the individual spindle heads, which are arranged to slide on guideways on a base, by a barrel-type cam mounted on the shaft *E*, close to the wormwheel. Motion is imparted to each spindle head by a lever fitted with a follower roller which engages with the track in the cam. At the ends of the levers there are gear segments which mesh with racks attached to rods connected to the individual spindle heads. With this arrangement, the spindle heads are traversed towards and

Fig. 3. The machine shown in this close-up view has been built by Paterex, Ltd., for chamfering both ends of bores in nut blanks on a fully- automatic cycle

Fig. 4. Paterex, Ltd., have built this multiple-barrel finishing machine to meet their particular requirements for handling fairly large batches of small components. The barrels can be removed from the machine for loading and unloading workpieces, and are driven individually, under the control of separate timers

away from each other for the chamfering and return strokes. The levers are so disposed that chamfering is carried out by one pair of spindles during the return stroke of the other pair.

When a pre-set torque is applied to the shaft *E*, for example, in the event of a blank becoming jammed between the end of a chute and an indexing carrier, a plunger at the upper end is moved in an axial direction, to operate a micro-switch to stop the machine. The wormwheel, spiral gears, and cam run in an oil bath. Interchangeable work carriers can be fitted to take nut blanks with bores of different diameters up to ⅜ in. As an indication of the productive capacity of the machine, it is stated that stainless steel nut blanks of the largest size that can be handled, can be chamfered at the rate of 280 per min.

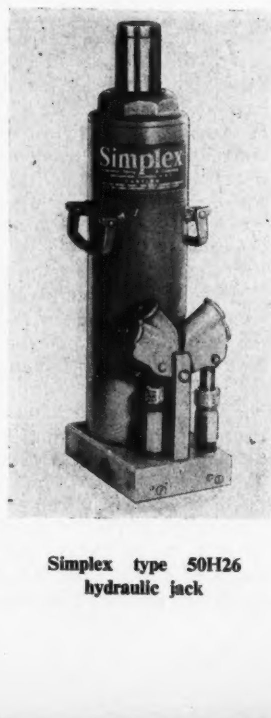
Freedom from burrs and sharp edges is specified for most components made by Paterex, Ltd., particularly those required for the aircraft industry, and the multiple-barrel finishing machine shown in Fig. 4 has been built by the company to meet their special need for handling fairly large batches of a variety of small items. There is a total of eight rubber work barrels, each of which has an internal diameter of 8½ in. and is 13 in. long. Any barrel can be removed from the machine independently for loading and unloading workpieces, which can be carried out while finishing of other components within the remaining barrels proceeds. When a batch of parts has been loaded into a barrel, an end cover is fitted, and the barrel is then mounted on friction discs on a pair of horizontal driving shafts. Drive to these shafts is taken from a single motor, through a roller chain and sprockets, and separate solenoid-operated clutches. Interchangeable friction discs of different diameters can be mounted on the driving shafts to give barrel speeds of 40 and 60 r.p.m.

The clutches for transmitting the drive to the individual pairs of shafts are engaged by levers at the ends of the machine, and the periods for which barrel finishing is to be carried out on the various batches of workpieces, can be pre-set independently by means of separate timers. When the pointer on a particular timer has been brought to the zero position at the end of the pre-set period, the corresponding clutch is disengaged by means of a solenoid, to stop the work barrel.

Simplex Type 50H26 Hydraulic Jack

In the figure is shown the Type 50H26 hydraulic jack of 50 tons capacity, which has been added to the Simplex range marketed by the Equipment & Engineering Co., Ltd., 2 & 3 Norfolk Street, London, W.C.2. This jack has a lowered height of only 26 in., but permits the relatively high lift of 20 in. to be obtained.

High- and low-speed, hand-operated pumps are provided which can be used separately or in unison, and the jack, which is equipped with Neoprene seals and spring-loaded ball valves, may be employed horizontally or vertically.



Simplex type 50H26 hydraulic jack

Slack & Parr Unit Head Machines

By G. W. MASON, Associate Editor

SLACK & PARR, LTD. (MACHINE TOOL DIVISION), Kegworth, near Derby, who are well known as makers of multi-spindle drilling attachments of fixed- and adjustable-centre types, have built a number of air-hydraulic machines incorporating unit heads of their own design, for performing drilling, tapping, reaming, and countersinking operations, for example, on particular components. Townsend-Coates, Ltd., 167 London Road, Leicester, have been appointed sole agents for special-purpose machines built by Slack & Parr, Ltd., some examples of which are here described.

With a typical unit head made by the company for drilling and reaming, a slide which carries the motor-driven spindle assembly is mounted on rectangular guideways on a base member, and feed and rapid traverse movements are provided by an air-hydraulic system. During the drilling stroke, fluid is delivered to the piston-rod end of the hydraulic traversing system by compressed air from the shop supply, which is applied to the upper end of an air-oil reservoir. At the same time, fluid which is discharged from the other end of the traversing cylinder is passed to a second reservoir, through a one-way restrictor valve, and the latter can be adjusted for varying the feed. At the end of the stroke, a 4-way air valve is reversed, with the result that fluid from the second reservoir is delivered to the traversing cylinder, to return the slide to the starting position. When the unit is operated by compressed air at 80 lb. per sq. in. pressure, a thrust of about 450 lb. is applied to the slide during the drilling stroke. The slide normally has a working stroke of 4 in., and the space occupied by the base is $17\frac{5}{8}$ by $8\frac{3}{4}$ in.

The machine shown in Fig. 1 incorporates two unit heads, and is intended for drilling, countersinking and tapping closely-spaced holes in bronze piston components for motor-car disc brakes in a cycle time of 8 sec. Two interchangeable work-holding fixtures have been supplied for mounting on the 12-station indexing head at the left-hand end of the base, to take components of different sizes. Components to be drilled and tapped are held in the fixture by eccentric-type clamps, which are tightened individually by means of radially-extending levers. The working cycle is started by a push-button type air valve, and the fixture is then indexed by a Geneva mechanism through a rack and pinion. At the end of this movement, an air-operated slide mounted on the base between the drilling head *A* and the tapping head, is advanced so that a pair of probes enter the holes in the piston at the 6 o'clock position on the fixture, which was drilled at a previous cycle. When the slide has been moved to its full extent, a micro-valve is operated to start the drilling operation. A pair of $\frac{3}{8}$-in. deep holes is then drilled in the component at the 9 o'clock position on the fixture in readiness for tapping 4 B.A. At the same

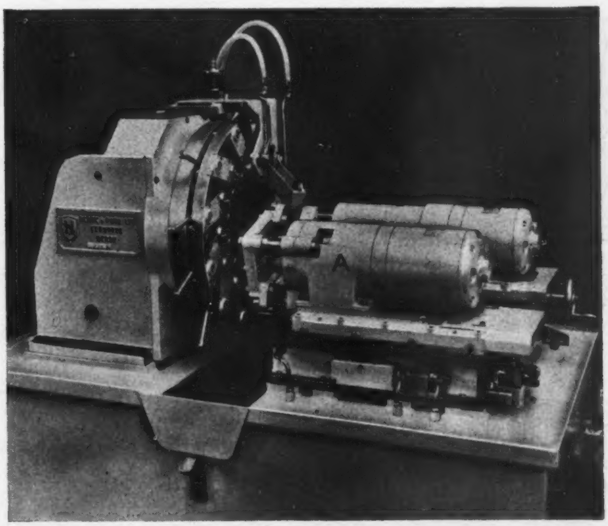


Fig. 1. This Slack & Parr unit head machine is designed for drilling and tapping 4 B.A. by $\frac{3}{8}$-in. deep holes in pistons for disc brakes. Interchangeable work fixtures are provided for handling parts of different sizes, and separate sets of cutter spindles on the unit heads can be brought into use for drilling and tapping holes at a centre distance of $\frac{5}{16}$ or $\frac{3}{8}$ in.

time, the holes in the piston at the next position, which were drilled at the previous cycle, are countersunk by twist drills mounted on the same head.

At the beginning of the drilling operation, a cylindrical guide bar attached to the spindle head slide enters a guide bush in the fixture, which is thus located positively for angle. A cam on the spindle head slide then operates a micro-switch, which starts the $\frac{1}{4}$-h.p. driving motor for the tapping head. From the spindle of this head, drive is taken by gears to a leadscrew in mesh with a nut, and the resulting feed per rev. is slightly less than the pitch of the threads to be cut in the work. Since the taps are mounted in floating-type holders, they can move independently of the spindle head slide under the cutting action to compensate for the difference between the feed and the thread pitch. At the beginning of the tapping stroke, an air valve is opened to deliver cutting fluid in mist form to the taps. When the holes have been tapped for their full depth, an adjustable cam on the spindle head slide operates another micro-switch to reverse the driving motor. At the end of the return travel of the slide, another cam actuates a third micro-switch to stop the motor. The slide can be advanced by means of a handwheel attached to the leadscrew, also "inched" in either direction, by push-buttons, to facilitate setting.

During each indexing movement of the fixture, the operating lever for one of the clamping arrangements is depressed by a striker plate, to release the completed component at the 12 o'clock position, and it is then ejected by an air cylinder, to be discharged from the machine by way of a chute. At the end of the working stroke of the drilling head, a valve is opened, and a supply of compressed air is delivered to the locating pieces on the fixture at the 12 o'clock position to remove any swarf. Simultaneously, compressed air is delivered through a nozzle assembly to the workpiece between the countersinking and probe positions, for removing swarf from the drilled holes.

The centre distance between the holes is $\frac{9}{16}$ in. on certain components, and $\frac{5}{8}$ in. on others, and the Slack & Parr gearless-type attachments mounted on the drilling and tapping heads have separate sets of spindles which can be readily brought to the working positions, as required. For changing the set-up on the drilling unit, the slide is brought to its extreme right-hand position, and two cylindrical guide bars, which pass through bores in the main spindle head and the carrier for the multiple spindles, also through guide bushes in the drill bush plate, are first removed. The spindle carrier and the drill bush plate are then turned through 90 deg., and the guide bars are passed through another set of bores in the carrier and bushes in the plate, but through the same bores in the main spindle head. The twist drills are now removed from one set of spindles and are mounted in the other set. No guide bush plate is provided on the tapping unit, and for changing the set-up, the carrier for the multiple spindles is turned to the required position. Different probes can be brought into use as required, depending upon the centre distance of the holes in the work, by reversing the carrier on which they are mounted.

In Fig. 2 is shown a unit head machine which has been built by the company for carrying out drilling and spot-facing operations on a

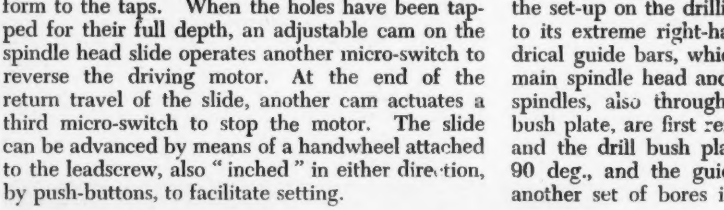


Fig. 2. Four unit heads are incorporated in this machine for drilling and spot-facing a light-alloy bail component for a vacuum cleaner

light alloy bail component for attaching the handle to the body on a domestic vacuum cleaner. This machine incorporates four unit heads, three of which—for drilling operations—are arranged horizontally at right-angles to each other, and the fourth—for spot-facing—vertically on the column. The left-hand head provides for drilling a single hole, and the right-hand head two holes, of 8·1-mm. (0·319-in.) diameter, and the spindles are run at a speed of 1,450 r.p.m. A No. 31 size hole is drilled in the work by the unit at the rear, which has a spindle speed of 3,380 r.p.m. The vertical unit is fitted with a Prolite spot-facing cutter, and the spindle speed is 1,000 r.p.m.

Fig. 3. A 60-spindle unit head machine for drilling holes in acoustic-insulating boards on an automatic cycle. The slide for the work-holding fixture is indexed by an air cylinder, and located at the various drilling positions by pins in conjunction with an air-operated plunger

When a component has been loaded into the fixture, a door at the left-hand side is closed by hand and this action serves to operate a valve, with the result that the part is secured by a toggle clamp operated by an air cylinder, the coolant supply is turned on, and the working cycle is started. At the same time, compressed air is passed to another cylinder, which serves to hold the door in the closed position while machining is in progress. Movement is imparted to the spindle head slide on each unit during the working stroke by compressed air which is delivered to one end of the traversing cylinder. Hydraulic fluid which is discharged from the other end of the cylinder is passed to a reservoir by way of a regulator valve which provides for varying the feed.

The machine is set so that the right-hand head is brought to the end of its working stroke after drilling and spot-facing have been completed by the other units. Operation of a valve, by an adjustable stop on the right-hand head, then causes compressed air to be delivered to the reservoir, and the slides of all the units are returned to their starting positions hydraulically. When the slide of the right-hand head has been brought to the end of its return stroke, another valve is operated by a second adjustable stop, with the result that the work-holding clamp and the door are released, to enable the completed workpiece to be removed.

A MULTI-SPINDLE MACHINE FOR DRILLING ACOUSTIC-INSULATING BOARDS

The machine shown in Fig. 3 incorporates a 60-spindle head, and is designed for drilling acoustic-insulating boards which have surface areas of 2 ft. by 2 ft. and 4 ft. by 2 ft. The board to be drilled is held in contact with the vertical surface of the fixture, as shown, by a number of upper and lower air-operated clamps. For loading, the board is passed between sets of rollers at the top and bottom of the fixture, which engage with the edges and the front face, and is brought into contact with an end stop.

Mounted on guide bars which are fitted with bellows-type guards, the fixture slide is traversed by an air cylinder to move the board from one drilling position to the next. The slide is located at the different positions by means of pins in a plate at the rear of the fixture, which are set at a centre distance of 1⅛ in., and are brought, in turn, into contact with an air-operated plunger. When the drilling head has been moved away from the work after drilling of a row of holes, the plunger is brought clear of one of the pins, and during the movement of the fixture slide under the action

of the traversing cylinder, it is returned to its original position. Further movement of the slide brings the next pin into contact with the plunger, in readiness for drilling another row of holes. During the drilling operation, the pin is held in engagement with the plunger by air pressure.

A UNIT HEAD MACHINE FOR IN-LINE REAMING

Fig. 4 is a close-up view of a unit head machine which has been built by the company for in-line reaming holes in a magnesium component for a dictating machine. The component, indicated at *B*, is secured to the lower surface of the hinged cover for the fixture by hand-operated toggle clamps, and the cover is then swung to the closed position. The spindle head *C*, for one of the reaming units, has a working stroke of 9 in. on the base guideways, and is fitted with a 4-spindle gearless attachment. It provides for in-line reaming pairs of holes in fairly thin walls at opposite ends of the component. A 2-spindle gearless attachment is provided on the second unit head, which is secured to the base at right-angles to the first, and is employed for in-line reaming other holes in the workpiece.

SET-UPS ON S.P.K. BENCH-MOUNTED DRILLING MACHINES

In MACHINERY, 97/1088—9/11/60, reference was made to the company's latest bench-mounted drilling machine of the rising table type, which is specially designed for operation in conjunction with their multi-spindle attachments. The 13- by 7-in. work-table has a vertical travel of 2 in., and an automatic cycle of rapid power traverse upwards, feed, and quick return is provided by an air-hydraulic system. Rapid approach, total

Fig. 5. This S.P.K. bench-mounted air-hydraulic machine is fitted with a Bristol-Erikson air-operated indexing unit and a multi-spindle head for drilling 25 holes in telephone ear and mouthpiece components

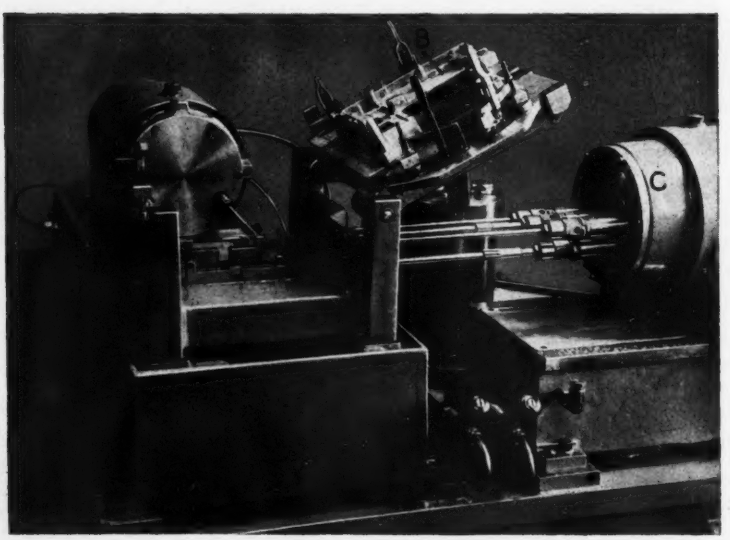


Fig. 4. Close-up view of a Slack & Parr unit head machine for in-line reaming holes in a magnesium frame component for a dictating machine

travel of the table, and feed, can be varied steplessly by separate knobs, and the cycle is started by a lever, or by two push-buttons which must be depressed simultaneously.

The machine is shown in Fig. 5 fitted with a Bristol-Erickson 6-station, air-operated indexing unit (Bristol Tool & Gauge Co., Ltd.) and a multi-spindle attachment, for drilling ⅛-in. diameter holes in ear and mouthpiece components for telephones. A hole is drilled at the centre of the component, and there are 8 equally spaced on a circle of ½ in. diameter, and 16 on a circle of 1 in. diameter. All the holes are drilled in a cycle time of 8 sec., and the spindles are run at a speed of 1,420 r.p.m. A close-up view of the fixture which is fixed to the Bristol-Erickson unit is given in Fig. 6.

When a component has been loaded on to one of the work-holders on the fixture, both push-buttons at the front of the bed are pressed. The Bristol-Erickson unit is then indexed, and the table is moved upwards to perform the drilling operation. At the end of the upward travel, the table is rapidly returned to its starting position. Four sets of spindles are incorporated in the head, one of which, at the first working station, provides for drilling the central hole in the workpiece, and alternate holes in the outer ring. The spindles at the 2nd and 3rd working stations are employed

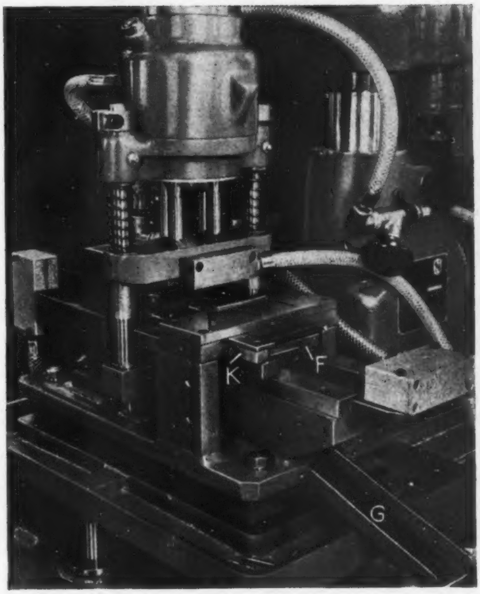


Fig. 7. This close-up view shows the fixture and [illegible] gearless multi-spindle attachment mounted on another S.P.K. bench-type machine for drilling two 0·0465-in. diameter cross holes in each of two small-diameter spindle components. The machine operates on a fully-automatic continuous cycle

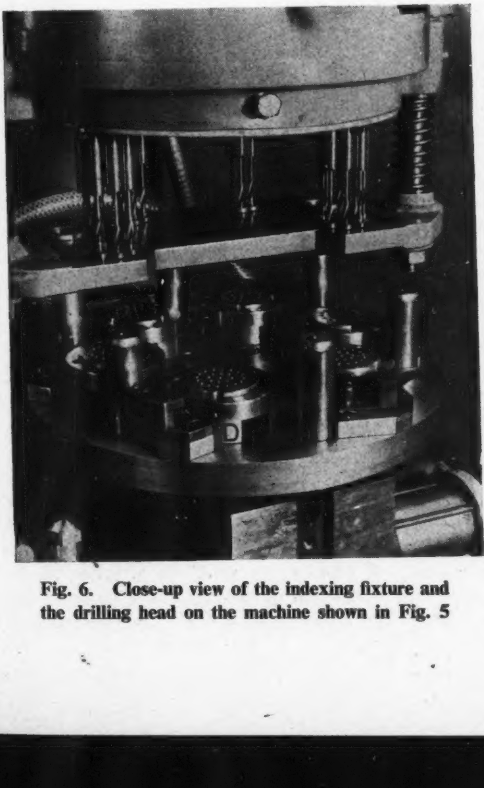


Fig. 6. Close-up view of the indexing fixture and the drilling head on the machine shown in Fig. 5

for drilling alternate holes in the inner ring, and those at the 4th station, for drilling the remaining holes in the outer ring. Six cylindrical pillars are mounted on the fixture, two of which enter bushes in the plate for the twist drill guide bushes during the upward movement of the table, to ensure accurate location of the workpieces. When drilling is in progress, the workpieces are held down by the bush plate, the latter being spring-loaded and attached to cylindrical guide bars which can slide in bores in the spindle head. When the fixture is being indexed, the components are prevented from moving on the holders by rubber pads attached to spring-loaded arms, one of which is indicated at *D*.

Fig 7 is a close-up view of another S.P.K. bench-mounted machine, fitted with a special work-holding fixture, and set up for operation on a fully-automatic continuous cycle, for drilling two 0·0465-in. diameter cross holes in each of two small-diameter spindle components for electric shavers.

Workpieces to be drilled, each of which has a reduced-diameter, threaded portion at one end, are

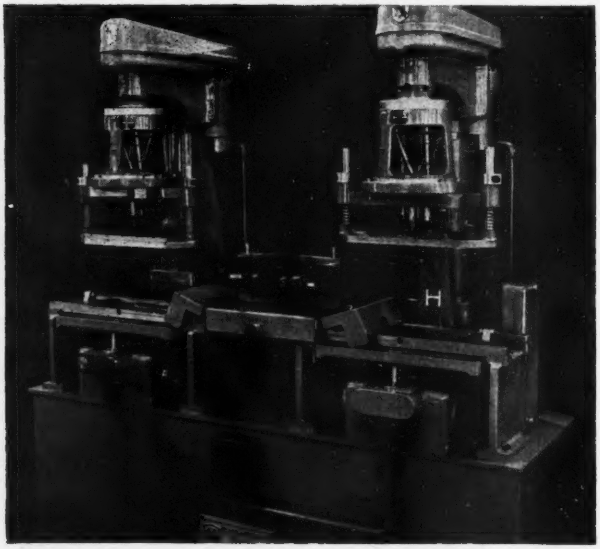


Fig. 8. Two S.P.K. machines are here shown mounted on a cabinet base and set up for drilling and tapping holes in a cylinder head for an air compressor. The right-hand machine has been modified to provide leadscrew control for tapping operations

stacked in profile slots in the top plate *E* of a "stationary" bridge-piece on the fixture. At the end of a drilling cycle, the work-table—and with it the fixture—is brought to the lowered position, as shown, and the slide *F* is traversed to the right by an air cylinder, on guideways on the base. During this movement, the drilled components are ejected from V-shaped slots in the slide *F*, by a wiper plate, and fall into the chute *G* down which they are discharged from the machine. At the same time, a shutter interposed between upper and lower top plates of the bridge-piece is moved transversely by the action of the cam *K*, and a pin attached to an extension piece on the slide. Two components now pass through openings in the shutter and the lower plate into the slots in the slide *F*. Next, the slide is returned to the drilling position, where it is located by a fixed stop, and at the beginning of this movement the shutter is returned to its original position by a spring. When the slide has been brought to the end of its travel, the parts to be drilled are held between the ends of the slots and a pair of spring-loaded plungers incorporated in a block at the left-hand end of the fixture. Downward force is exerted by a clamping piece attached to the spring-loaded casting for the twist drill guide bushes, when the work-table is moved upwards for the drilling operation. The spindles in the gearless drilling attachment are run at a speed of 4,000 r.p.m.

The installation shown in Fig. 8 incorporates two S.P.K. machines mounted on a cabinet base and fitted with multi-spindle attachments, of the adjustable-centre type, for drilling and tapping holes in cylinder heads of different designs for air compressors, which are made in fairly small batches. The spindles can be readily set for centre distance with the aid of guide bushes for the drills and taps. These bushes are located in the pressure plates to suit the required pattern of holes in the workpiece.

Mounted above the work-tables of the machines is a pair of guide rails for the slide which carries the work-holding fixture. These guide rails are made in three parts, and the central portion is fixed to a pair of support pieces secured to the base between the machines. The outer portions of the guide rails are located by slots in these support pieces and in others at the ends of the base, and are connected to the tables of the machines by pins. For loading and unloading workpieces, also for removing swarf from the holes in the component following the drilling operation, the fixture slide is moved on to the central portion of the guide rails as shown. The slide is then moved to the left or right, depending upon the operation to be carried out, and is located in the machining position by a plunger which enters a hole in the front guide rail. During the upward movement of the table for the drilling or tapping operation, the outer portion of the guide rails is raised clear of the slots in the support pieces, and guide pins on the fixture enter bushes in the pressure plate, to ensure accurate location of the work in relation to the cutter spindles.

Drilling is carried out by the left-hand machine which is of standard design, and the working cycle is started by a lever. The right-hand machine has been modified to provide lead-screw control for tapping operations. To this end, the hydraulic dashpot arrangement normally provided to give the cutting feed, also the lever for starting the cycle, and the knobs for varying the feed and rapid traverse movements of the table, have been removed. A bracket, as at *H*, is attached at its lower end to the rear of the table, and incorporates a nut at the upper end, which engages with a

leadscrew driven from the multi-spindle attachment.

The tapping cycle is initiated by depression of a push-button, which starts the spindle-driving motor, and upward movement is imparted to the table by the action between the leadscrew and nut. At the same time, compressed air at controlled pressure is delivered to the table-traversing cylinder housed in the bed, which serves to counterbalance the table, the outer portion of the guide rails, and the work-holding fixture. When the table has been brought to the end of the tapping stroke, the spindle-driving motor is reversed by a micro-switch.

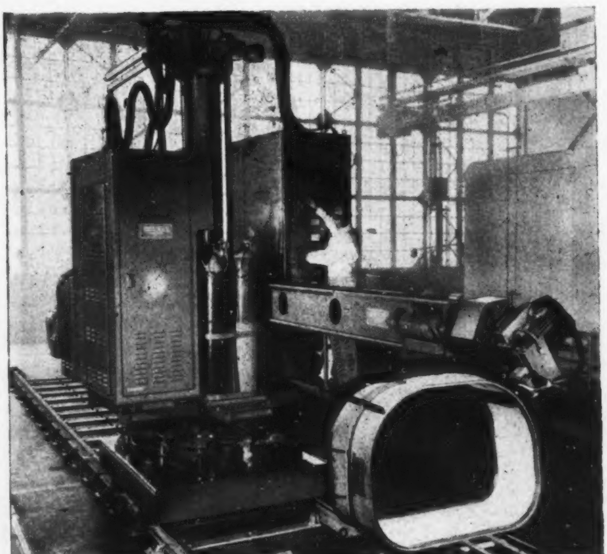
Sciakydyne Zero-error Motor Control System

Sciaky Bros., Inc., Chicago 38, Ill., U.S.A., have introduced the Sciakydyne Zero-error motor control system which provides a direct link between an a.c. power source and a d.c. motor, and, it is stated, may be regarded the electronic counterpart of a rotating amplifier.

The system, which has the advantage of being static, includes an additional feed-back loop which makes an absolute comparison between input and output, and enables complete equality between the two values to be achieved. Through this additional loop, moreover, flat regulation at any speed is obtained, as well as compensation for temperature and component variation. The control dials are, therefore, calibrated directly in rational units, for example, r.p.m. or in. per min., and they are automatically maintained in calibration. The normal speed range is 100 to 1, but equipment with a 300 to 1 range has been produced. The system has a very high speed of response, and it is stated that the armature current can be reversed within half a cycle, or 8 milli-sec.

It is claimed that the Sciakydyne system combines the reliability of the 2-phase servo with the speed of response, power, and torque stiffness of a hydraulic servo, and has higher efficiency. Motors up to 100 h.p. can be controlled by the system, and where applicable it is used throughout in Sciaky welding equipment. An example of such an application is afforded by an integral boom and manipulator fusion welder supplied to the North American Aviation Inc., as shown in the accompanying figure. The Sciakydyne system is employed for arc space regulation, and as a speed control for boom elevation, boom traverse, base traverse, and head rotation. The workpiece assembly shown in the illustration is an experimental duct, which is fabricated from stainless-steel honeycomb material.

Sciaky Bros. Inc., are associated in this country with Sciaky Electric Welding Machines, Ltd., Falmouth



Sciaky integral boom and manipulator fusion welder provided with Sciakydyne Zero-error motor control

New Design of Sheet Metal Fastening. Mr. A. A. Oakes, a graduate student of the Philadelphia Museum College, Penn., U.S.A., was among the winners of Alcoa Student Design Merit Awards for 1961. This award was made for a fastening arrangement that is described as a "sheet metal zipper."

Flanges of suitable form are provided on the edges of aluminium sheets, and a joint is made by sliding a piece of polyethylene or aluminium tubing, which has been slit longitudinally, over these flanges. No tools are required. It is stated that the polyethylene tube can be readily stripped from a joint when it is required to break down a temporary structure, whereas a more permanent connection is provided when the aluminium tubing is employed.

NEW PRODUCTION EQUIPMENT

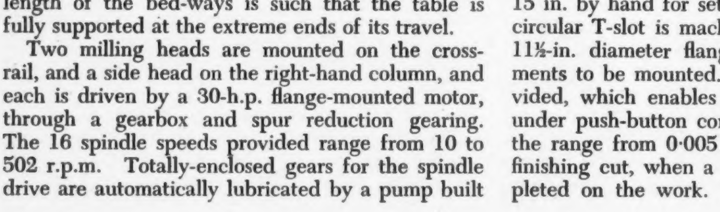
Edited by
G. W. Mason
and
A. J. Barker

Noble & Lund Heavy-duty Plano Milling Machine

Built recently by Noble & Lund, Ltd., Gateshead, 10, the heavy-duty plano milling machine shown in the figure has a capacity for work up to 7 ft. wide by 6 ft. high, and the 15-ft. by 6-ft. T-slotted work-table, which is a deep, well-ribbed, box-section casting, has a maximum travel of 15 ft. on broad rectangular-section bed-ways. The length of the bed-ways is such that the table is fully supported at the extreme ends of its travel.

Two milling heads are mounted on the cross-rail, and a side head on the right-hand column, and each is driven by a 30-h.p. flange-mounted motor, through a gearbox and spur reduction gearing. The 16 spindle speeds provided range from 10 to 502 r.p.m. Totally-enclosed gears for the spindle drive are automatically lubricated by a pump built into the head, and the shafts on which they are mounted run in ball and roller bearings. An ammeter is provided on each head to indicate the load on the driving motor, and push-buttons are provided for "inching" the cutter spindle to facilitate gear changing.

Made from alloy steel and precision ground, the cutter spindle runs in taper roller bearings, and the nose end conforms to the requirements of B.S.1660: 1953. The spindle has an axial adjustment of 15 in. by hand for setting the depth of cut, and a circular T-slot is machined in the end face of the 11½-in. diameter flanged quill, to enable attachments to be mounted. A fine feed motion is provided, which enables the spindle to be advanced under push-button control by a pre-set amount in the range from 0·005 to 0·024 in., for applying a finishing cut, when a roughing cut has been completed on the work. When the push-button has been pressed, the following automatic sequence takes place:—A clamping arrangement is released, the spindle is advanced by the pre-set amount, and the clamp is tightened. In addition, rapid power traverse can be applied to the spindle under the control of a push-button.



This Noble & Lund heavy-duty plano milling machine has a capacity for handling workpieces up to 7 ft. wide by 6 ft. high, and the maximum table stroke is 15 ft.

Both cutter heads on the cross-rail can be swivelled through 20 deg. on each side of the vertical position, for milling inclined surfaces, and they can be traversed simultaneously or independently. A minimum centre-distance of 31½ in. is obtainable between the cutter spindles. These heads have long bearing surfaces, and gibs permit adjustment for align-

ment. The length of the cross-rail is such that when one milling head has been moved clear a cut can be taken by the other head on workpieces up to the maximum width that can be handled on the machine. The side head is counterbalanced by a weight housed in the column, and the maximum distance obtainable between the centre line of the cutter spindle and the table is 64 in. Clamps for securing the side milling head to the column ways and the other heads to the cross-rail are tightened and released by means of push-buttons. Optical measuring equipment is provided for the heads.

Eighteen feeds from 0·4 to 30 in. per min. are provided for the table, and the side and cross-rail milling heads, drive being taken from a 10-h.p. motor, through a gearbox housed in the right-hand column. From the gearbox, drive is transmitted by a hardened steel worm in mesh with a cast iron worm-type rack bolted to the table. Ball thrust bearings are provided for the worm shaft, and the feed gears are lubricated by a built-in pump. For rapid power traverse there is a separate 20-h.p. motor, which can be brought into use by means of a push-button without the need for disengaging the feed. As soon as the push-button is released, rapid traverse is disengaged, and feed is again applied. This arrangement permits of quickly positioning the work in relation to the cutter when small, widely-spaced, surfaces are to be milled, for example, on bedplate components.

The side and cross-rail milling heads can be adjusted by hand, and feed and rapid traverse movements are transmitted by way of electro-magnetic clutches. Handwheels are mounted on both sides of the bed for traversing the table, and are interlocked with the feed and rapid traverse motions to prevent simultaneous engagement.

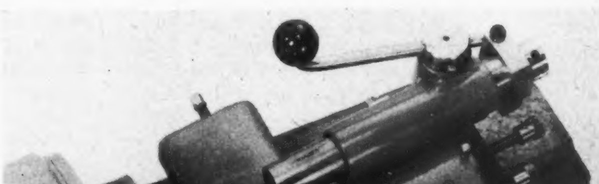
The cross-rail is of considerable depth, and is bow-shaped at the rear to ensure the necessary strength to prevent deflection when heavy milling cuts are being taken on the work. It is adjusted in a vertical direction by a pair of screws, positioned in front of the column ways to reduce the risk of tilting, and driven by reduction gearing from a 15-h.p. motor, mounted on the cross bracing member at the tops of the columns. Quick-acting, push-button operated, power clamps secure the cross-rail in the required position on the column. Bellows-type guards are provided for the cross-rail and column ways, and covers, of roller shutter type, for the bed-ways, are attached to the ends of the table. Coolant from a reservoir in the bed is delivered to the milling cutters by a motor-driven pump through flexible hoses.

Duplicate sets of push-buttons for controlling the various driving motors on the machine are built into a pendant-type panel and a floor-mounted console, and a comprehensive system of interlocks is incorporated. For example, there is a pressure switch which prevents traverse motion being imparted to the table until the company's patent Fluilink system, which provides for automatic lubrication of the bed-ways, has been brought into operation. Similarly, table feed cannot be engaged until the spindle driving motor on one of the milling heads has been started.

The machine weighs approximately 82 tons, and occupies a floor space of 38 ft. by 24 ft.

Stopp Type EPM11 Finishing and Second-operation Lathe

In the figure is shown the type EPM11 finishing and second-operation lathe made by Dr. Ing. Robert Stopp, Weinheim/Bergstrasse, West Germany, for whom the sole agents in this country are F. J. Robotham & Co., Ltd., 71 Lascelles Road, Slough, Bucks. It has a centre height of 3 $\frac{7}{16}$ in., and with a normal-length bed, the distance between centres is 6 in. If required, a longer bed can be provided to give a maximum length capacity of 13 in.



Stopp type EPM11 second-operation lathe

The bed is cast integral with the headstock, and the latter incorporates a built-in motor which is coupled directly to the work-spindle. A single-, 2-, or 3-speed motor can be provided, the latter being of 0·25/0·35 h.p. with normal speeds of 670, 1,300, and 2,800 r.p.m. If desired, however, the low speed may be 930 r.p.m. The spindle, which is bored 25 mm. (0·984 in.), is mounted in heavy-duty sealed ball bearings and can be supplied to take either draw-in or push-type collets. A maximum diameter of $\frac{11}{16}$ in. is accommodated in the standard collets, but step collets up to 1 in. diameter by $\frac{3}{16}$ in. depth capacity can be supplied, also enlarged-head collets up to 2 in. diameter by $\frac{3}{8}$ in. depth capacity. Closing pressure is applied to the collet by adjustable disc springs which are retracted by means of a foot lever, and this lever also controls the starting and stopping of the spindle motor, and the application of a brake. An adapter can be provided to take step chucks with diameter capacities up to 3 in.

Of the hand-lever and rack operated type, the compound swivelling cross-slide has a cross travel of $3\frac{1}{2}$ in., a longitudinal travel of $2\frac{5}{32}$ in., and a swivel adjustment of 45 deg. to the right and left. Adjustable screw stops are provided for both directions of travel. If desired, an adapter plate can be fitted which is provided with T-slots to enable a rear tool-holder to be mounted. A plain, lever-operated, cut-off slide, with a travel of $3\frac{1}{2}$ in., to take front and rear tool-holders, is also available.

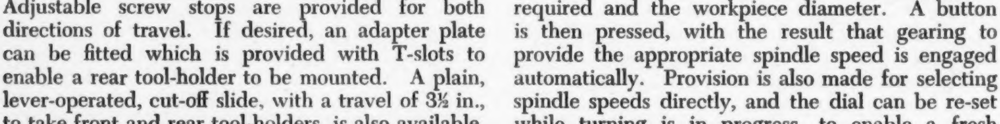
The lathe can be supplied with a lever-operated tailstock with a quill travel of $2\frac{3}{8}$ in., which can be arranged to take collets up to $\frac{11}{32}$ in. or $\frac{1}{2}$ in. diameter, or a No. 1 or a No. 2 Morse taper centre. Another type of tailstock which can be fitted is handwheel operated, and has either a No. 1 or a No. 2 Morse taper. If required, the tailstock can be replaced by an indexing turret tool slide.

As an alternative to bench mounting, the lathe may be supported on a welded-steel base which may incorporate a coolant system. A bracket can be supplied which enables the lathe to be mounted with the spindle in the vertical position. Other equipment available includes an electrically-controlled spindle reversing unit for threading operations. There is also a type EPM111 lathe, with similar features, the spindle of which will take draw-in collets up to 1-in. capacity. Step chucks with diameter capacities up to 4 in. can be employed with the aid of an adapter. Other adapters are available for both lathes to take expanding mandrels, drill chucks and 3-jaw chucks.

LeBlond Servo-Shift Speed Selection System

With the Servo-Shift speed selection system for lathes, which has been developed by the R.K. LeBlond Machine Tool Co., Cincinnati, Ohio, U.S.A., a dial mounted on the headstock is set manually in accordance with the cutting speed required and the workpiece diameter. A button is then pressed, with the result that gearing to provide the appropriate spindle speed is engaged automatically. Provision is also made for selecting spindle speeds directly, and the dial can be re-set while turning is in progress, to enable a fresh speed to be obtained with a minimum of delay, before taking a further cut at a different diameter.

If required, an additional set of controls for the system can be provided on the apron, to avoid the delays which may occur when frequent speed changes are necessary, particularly on long-bed

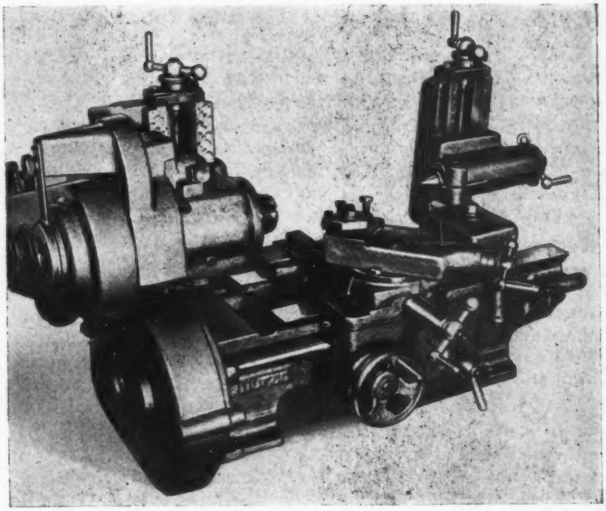


This LeBlond heavy-duty lathe is equipped with the new Servo-Shift speed selection system

machines. When this arrangement is employed, an illuminated digital display unit can be mounted on top of the headstock, as shown in the figure, to indicate the cutting and spindle speeds in use.

The system is at present incorporated in the company's type NK machines, and will shortly be available for other heavy-duty lathes in their range. Wickman, Ltd., Fletchamstead Highway, Coventry, are the British agents for the R.K. LeBlond Machine Tool Co.

Murad Bormilathe Universal Machine



Murad Bormilathe universal machine for turning, boring and milling operations

The provisionally patented Bormilathe universal machine shown in the illustration has been introduced by Murad Developments, Ltd., Queenborough, Isle of Sheppey. Intended for bench mounting, this machine can be readily set up for turning, screw-cutting, boring and milling metal parts, also for performing a variety of woodworking operations, including turning, sawing, grooving, combing, tenoning, spindle moulding, and sanding.

Both the spindle housing and the housing for the tailstock barrel can be adjusted in the vertical direction on dovetail guideways, over a distance of 3½ in., to provide a maximum swing capacity over the bed-ways of 14 in. diameter, and the tailstock column can be set over on the base for taper turning. The 6-in. wide bed has an overall length of 22 in., and a maximum of 10 in. is admitted between the headstock and tailstock centres. Close-grained iron castings, of box-section, which form the headstock and tailstock columns, are bolted and keyed to the rear of the cast iron bed.

Bored $\frac{25}{32}$ in. diameter, the spindle will take a No. 3 Morse taper shank, and runs in pre-loaded angular contact ball bearings. It is threaded 1⅜ in. diameter by 8 t.p.i. at the nose end, and drive is taken by a belt and stepped pulleys from a Bronson ½-h.p. geared motor unit. Different speed ratios can be obtained by transposing pick-off gears between the motor shaft and the output shaft of the Bronson unit, to give spindle speeds ranging from 132 to 1,750, 66 to 875, or 14 to 583 r.p.m. The gearbox assembly can be swivelled on the end of the motor for adjusting the driving belt for tension.

From the spindle, drive to the ¾-in. diameter by 8 t.p.i. Acme leadscrew is taken by pick-off gears, which enable screw threads from 4 to 40 per in. to be cut. A sliding feed of 0·006 in. per spindle rev. is provided for turning operations. The leadscrew nut is mounted in dovetail guideways, and can be adjusted to compensate for wear. Micrometer drums are provided for the traversing screws for the cross-slide and the swivel top slide, also for the screws for adjusting the spindle housing and the tailstock barrel housing on the column ways.

A 7- by 8⅝-in. T-slotted table can be mounted on the saddle in place of the cross-slide assembly, when boring and milling operations are to be carried out. The table has a cross travel of 5 in., and the distance between the working surface and the top face of the bed is 2⅝ in. A 1-in. diameter arbor to take cutters for horizontal milling can be supplied. This arbor is fitted with keys at one end which engage with transverse slots in the end face of the spindle nose for transmitting the drive. The other end of the arbor is fitted with a bearing, and, when milling is in progress, it is supported by the tailstock barrel, the latter being bored No. 3 Morse taper. End mills, face milling cutters, and cutters for milling keyways, as well as boring tools, can be mounted in the spindle nose.

Other equipment available includes a 10-in. diameter faceplate, 4- and 6-in. diameter backplates for chucks, a rotating centre, V-blocks and angle plates for mounting on the work-table, and a saw bench and a combing fixture.

Arboga UM 400 Universal Machine Tool

On the Swedish-built Arboga UM 400 universal machine tool, which is marketed in this country by Kavanagh O'Moore & Co., Ltd., 1a Aldred Road, London, N.W.6, a self-contained, totally-enclosed spindle unit is employed, which incorporates a 2-speed, 0·25/0·15-h.p. motor. Four speeds from 365 to 2,800 r.p.m. can be obtained for the spindle, which has a No. 1 Morse taper bore in the nose. A cylindrical portion enables the unit readily to be clamped in various positions, and with this arrangement, there is no need to alter the transmission arrangements when changing the set-up to provide for a different machining operation.

For vertical milling, the unit is mounted at the outer end of a horizontal cylindrical bar, which is held in a clamp attached to the top of the column of the machine, as shown in Fig. 1, and the maximum throat depth is 3⅞ in. The column, which is adjustable vertically, and the bar can both be swivelled about their axes, by reference to graduated scales, and when the spindle unit is set in the vertical position, a maximum distance of 9⅝ in. is obtainable between the nose and the T-slotted surface of the work-table. The latter measures 14 by 5⅞ in., and has longitudinal, lateral, and vertical traverses of 5⅞, 2, and 3⅛ in., respectively, by means of hand-wheels which are provided with graduated drums. For drilling, the unit is mounted in a similar position, but the arrangement is such that the spindle can be traversed axially for a distance of 1¾ in. by means of a lever.

Fig. 1. The Arboga UM 400 universal machine is here shown set up for vertical milling

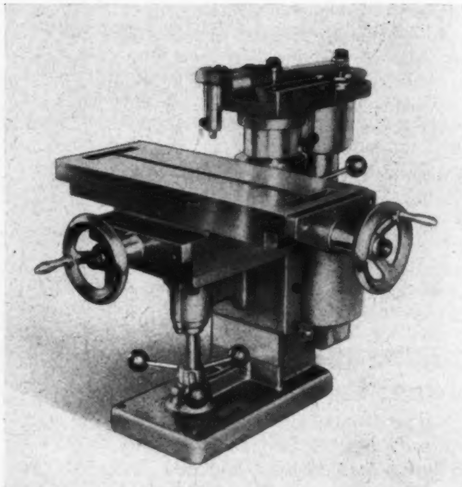


Fig. 2. The Arboga universal machine is here arranged for shaping, with the spindle unit suspended in an inverted position at the rear

When slotting is to be performed, the spindle unit is mounted at the rear of an attachment that is secured to the end of a lateral bar carried by the column, and drive to the tool-holder slide, which has a stroke length of 2⅛ in., is taken through an eccentric pin and a connecting link. For shaping, an attachment of similar design is mounted directly at the top of the column, as seen in Fig. 2, the spindle unit thus being suspended in an inverted position at the rear, and the maximum distance obtainable between the axis of the cylindrical tool-holder bar and the work-table is 5⅞ in.

To permit horizontal milling operations to be carried out, the spindle unit is mounted in the lower portion of a double clamp, which is secured to the column. The upper part of this clamp provides for the attachment of an overarm and bracket, to support the outer end of the ½-in. diameter arbor that is normally supplied. For surface grinding, the unit is mounted in a similar position, and a guard is employed which permits the use of wheels up to 4 in. diameter.

When the machine is set up as a lathe, the spindle unit is arranged longitudinally, and is attached by means of a double clamp to the left-hand end of a similarly-disposed bar, which is carried by the column. Diameters up to 1⅜ in. can be swung, and a tailstock unit, which is also mounted on the bar, may be adjusted to provide a maximum distance of 5⅝ in. between centres. Cutting tools are clamped in a square holder, which is secured to the work-table.

Redin No. 20 Gear De-burring Machine

Marketed in this country by Mortimer Machine Tool Co., Ltd., Mortimer House, Acton Lane, London, N.W.10, the American-built Redin No. 20 machine, here shown, is intended for de-burring external and internal gears with pitch diameters ranging from 0 to 20 and 1¼ to 16 in. respectively, down to 16 d.p. and with face widths up to 6 in., also other basically circular components with a wide variety of profile shapes, including splines. A No. 36 machine, of larger capacity, is also available.

The machine is designed for operation on a semi-automatic cycle, and the work is carried at the upper end of a vertical spindle. After the work has been loaded, a push-button is pressed, whereupon a cover, pivoted at the rear, is lowered to enclose the working area. At the same time, the grinding wheel, mounted on the spindle of an air-operated head, which is arranged laterally inside the cover, is brought into contact with the periphery of the work. Simultaneously, drive is engaged to rotate the work at a pre-determined speed between 1 and 10 r.p.m., and compressed air is supplied to the grinding head, to drive the spindle at a speed of 11,000 r.p.m. The spindle is arranged to "float", with the result that the profile of the work is followed automatically during the progress of de-burring, without the need for a formed wheel or the use of templates or gearing. After a pre-set period has elapsed, the cover is returned to the open position, and the grinding and work spindles are stopped.

Redin No. 20 gear de-burring machine

To allow for setting to suit the face width and diameter of the workpiece, vertical adjustment is provided and the grinding head is carried on a horizontal screw. Grinding wheels up to 4 in. diameter by ⅜ in. wide can be mounted on the spindle. If required, an additional head can be provided for de-burring the under-side of a gear simultaneously. This head can be adjusted independently, and when it is not needed, is rendered inoperative by means of a selector switch. The machine is arranged for connection to dust extraction equipment, and occupies a floor area of 3 ft. 11 in. by 3 ft. 4 in.

A NEW WIRE GALVANISING PROCESS has been introduced into this country by AEI-Birlec, Ltd., Tyburn Road, Erdington, Birmingham, 24. Originally developed in France, this process, it is claimed, offers both economic and technical advantages, as compared with the conventional sequence of annealing, pickling, fluxing, and dipping.

With the new method, annealing is carried out in such a manner that the pickling stage is not required, the wire being passed directly into the zinc bath at the correct temperature. The heat input necessary to maintain the temperature of the bath is thus considerably reduced. Apart from the savings that result from simplification of the process, it is stated that much higher wire running speeds can be employed. Greater production can thus be obtained from a given floor space.

It is also claimed that a zinc coating of improved quality is obtained, the intermediate layer of zinc-iron alloy being virtually eliminated. Treated wire can be subjected to re-drawing and other severe working without flaking, and both the hardness of the wire and the coating thickness can be controlled to meet a range of specifications.

A plant for galvanising by this process, which is now under construction, will have a capacity of about 1½ tons per hour.

Machine Shop Patents

AUTOMATIC LOADING UNIT FOR A CENTRELESS GRINDING MACHINE

The figure shows a side elevation of an electro-hydraulically operated unit, for automatically transferring ring-snaped workpieces to and from the working area on a centreless machine, arranged for plunge-grinding.

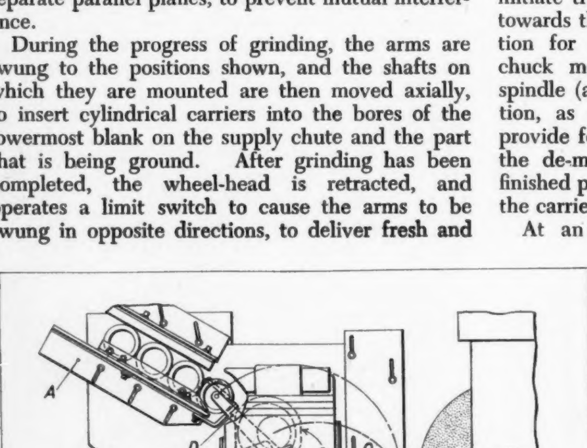
Blanks are supplied by way of the chute *A*, which is inclined downwards and has a stop at the lower end, and the completed workpieces are discharged down a second chute *B*. Parts are successively transferred to and from the working position, where they are supported on two shoes *C*, by means of the arms *D* and *E*, respectively. Secured to shafts mounted in the housing *F*, these arms are operated in unison, and are arranged to swing in separate parallel planes, to prevent mutual interference.

During the progress of grinding, the arms are swung to the positions shown, and the shafts on which they are mounted are then moved axially, to insert cylindrical carriers into the bores of the lowermost blank on the supply chute and the part that is being ground. After grinding has been completed, the wheel-head is retracted, and operates a limit switch to cause the arms to be swung in opposite directions, to deliver fresh and completed parts to the working position and the discharge chute, respectively. During these movements, the parts slide across a backing plate, and are thereby retained on the carriers. Motion is imparted to the arms through gearing and a common rack, which is mounted between guide rollers in the housing and is traversed by means of a crank. With this arrangement, the speed at which the arms are swung is reduced gradually as they approach the ends of their movements, to avoid shock. Next, the arm shafts are again moved axially, to withdraw the carriers from the parts, and the arms are subsequently returned to the original positions, in readiness for the next cycle.

Shortly before completion of a loading movement, a cam-operated limit switch is actuated to initiate traverse of the wheel-head of the machine towards the support shoes for the work, in preparation for grinding. Simultaneously, a magnetic chuck mounted at the nose of the work-head spindle (arranged at the rear of the working position, as viewed in the figure) is energized, to provide for driving the work during grinding, also the de-magnetizer *G*, which serves to hold the finished part at the top of the discharge chute when the carrier is withdrawn.

At an early stage during grinding, the de-magnetizer is de-energized to permit the completed part to roll down the discharge chute, and the electrical supply to the magnetic chuck is reversed when the wheel-head is retracted, to release the workpiece in readiness for unloading.

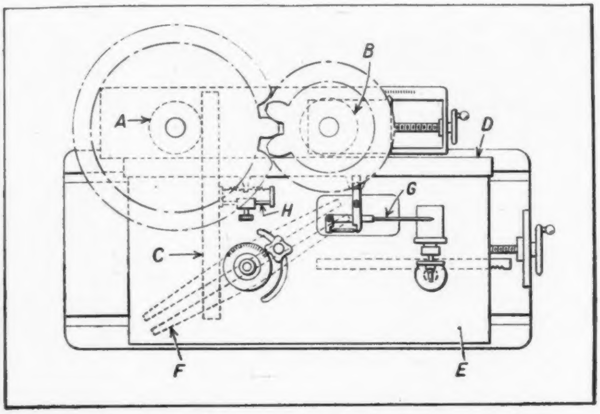
871,270. The Cincinnati Milling Machine Co., Cincinnati, Ohio, U.S.A. *[Application date in the U.S.A. November 14, 1958. Published June 21, 1961.]*



Side elevation of a unit for automatically loading and unloading workpieces on a centreless grinding machine

ROLLING GEAR TESTER

A plan view is shown in the accompanying figure of a rolling gear tester, of the type whereby errors on either or both of two meshing gears are detected by variation of the rate at which angular velocity is transmitted, and the arrangement is such that the diameters of the base circle discs em-



Base circle discs for use on the rolling gear tester here shown in plan need not be made with high accuracy

ployed are not related to the dimensions of the gears under inspection. In this way, the need for making discs with high accuracy is avoided.

The gears are carried at the upper ends of two vertical shafts, one of which is mounted in bearings in the bed of the unit. The second shaft runs in bearings in a longitudinal slide, which may be adjusted for setting the centre distance. Base circle discs *A* and *B* attached close to the lower ends of the non-adjustable and the adjustable shafts are held in contact with separate straight-edges *C* and *D*, which are carried in roller ways on the bed and are arranged laterally and longitudinally, respectively.

During testing, the slide *E* is traversed on longitudinal bed-ways, and serves to move the straight-edge *C*, on the upper face of which there is a vertical pin that engages a groove in the underside of the inclined bar *F* clamped to the slide. In this way, the associated shaft is turned, and motion is transmitted through the gears and the base circle disc *B* to the straight-edge *D*. During setting of the unit, the bar *F* is adjusted to such an angle with respect to the direction of traverse that when there are no tooth errors on either of the gears, the straight-edge *D* is moved at the same rate as the slide *E*. When an error is present, however, relative motion occurs between these two members, due to alteration of the angular velocity transmitted between the gears, and causes deviation of the recorder pen *G*, which is pivotally mounted on the slide and operated by a pivoted lever that is engaged between two lugs on the straight-edge. Also mounted on the slide, the recorder drum associated with this pen is rotated by means of friction discs and a pinion which engages a rack secured to the bed.

By means of tension springs, which are attached to both sides of another lug on the straight-edge *D*, and anchored to an adjustable carrier *H*, clamped to the slide, the system may be urged in either direction, for checking both sets of tooth flanks successively.

869,771. Maag Gear Wheel & Machine Co., Ltd., 219 Hardstrasse, Zurich, Switzerland. *[Application date in Switzerland April 23, 1958. Published June 7, 1961.]*

High Temperature Arc. The plasma thermometry laboratory of the U.S. National Bureau of Standards has developed an improved wall-stabilized, high-current density arc equipment, to provide a basic source of high temperature radiation, which is pure and stable. A feature of this equipment, which provides temperatures within the range from 10,000 to 20,000 deg. absolute, is that the electrodes are surrounded by an inert gas such as argon.

The gas to be studied is introduced in the central region, the argon serving to isolate it from the electrodes. As a result, a large number of gases, including oxygen and nitrogen, can be maintained at temperatures of the order of 15,000 deg. absolute, without electrode contamination. Moreover, the gases are introduced and exhausted in such a manner that it is possible to maintain the centre of the arc completely free from the buffer gas (argon).

Persons per Car in European Countries.—According to figures published in the July issue of the *EFTA Bulletin*, the number of persons per car in the EFTA and E.E.C. countries in 1959 ranged from 7 in Sweden to 63 (estimated) in Portugal. France had the second lowest number (9), followed by the United Kingdom and Luxembourg (10), Switzerland (12), Belgium and Denmark (13), West Germany (15), Norway (19), Austria (21), Netherlands (25), and Italy (30). By comparison it may be noted that in 1950 the numbers ranged from 21 in the United Kingdom to 137 in Italy. In that year France again had the second lowest number (27), followed by Sweden (28), Luxembourg (30), Switzerland (32), Belgium (35), Denmark (36), Norway (50), Netherlands (72), and West Germany (78).

Quick-change Press Lines for Producing Electrical Control Equipment

In a period of less than 20 years, the yearly output of electrical power distribution and control equipment by the Federal Pacific Electric Co., Newark, N.J., U.S.A., has risen in value from 1·5 to more than 100 million dollars. Successful operation in this competitive field necessitates efficient use of manufacturing equipment, and the company has developed some interesting practices, particularly in connection with presses.

Enclosures for switches, fuses, circuit breakers, and other electrical control equipment are important items. These sheet metal housings may require as many as 30 press operations, and are made by the company on a monthly production schedule. Quantities vary greatly, and are determined on the basis of stores inventories, and from sales forecasting.

When required in sufficient numbers, enclosure parts are made in progressive dies on large, heavy-duty, presses. In Fig. 1, a 1,000-ton Verson, eccentric-type, straight-sided press is shown set up for stamping covers for the company's Stab-lok circuit-breaker enclosures from 16-gauge coiled material. The latter is advanced by means of a mechanically-driven slide feed which operates in conjunction with a stock oiler and an automatic coil cradle.

Wherever possible, similar enclosures are employed for various applications. Many designs are standardized, in part, and the combined total production may then warrant the expense of making a progressive die for at least a number of the primary operations. Different secondary operations are subsequently performed on batches of the parts, using single dies.

In cases where the use of progressive dies is not feasible but production is relatively high and multiple operations are required, the company has developed a "quick-change press line" technique as seen in Fig. 2. These press lines are formed by rearranging presses according to the operations to be performed on a part. For this purpose some special plant layout facilities have been provided.

Fig. 1. Verson 1,000-ton mechanical press set up with progressive tools for producing sheet-metal enclosures for electrical control equipment

The department in which sheet-metal enclosures are made is equipped with 52 presses, the majority of which are in the 45- to 100-ton capacity range. These presses can readily be moved from one position to another by overhead travelling cranes that serve the entire area. In Fig. 3, an overhead crane is seen being used to move one of these presses to a different position. The presses, it may be noted, are not generally fastened down.

Air and electric power connections are available throughout the department, to enable the presses to be located as required. Electrical points are provided by a plug-in bus-bar system, which is a product of the company. The air lines and bus-bars are either supported overhead as may be seen in Fig. 3, or run through an under-floor trench system, as shown in

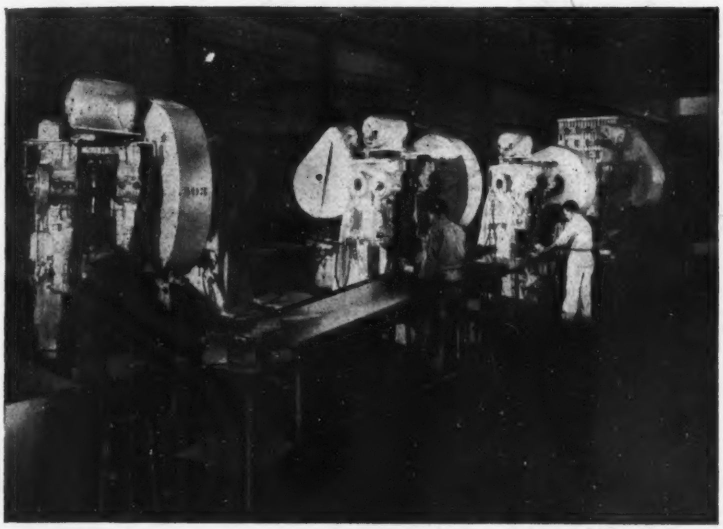


Fig. 2. An example of a "quick-change" line incorporating four presses

Fig. 4. With the latter arrangement, removable cast iron covers provide access to connection points.

It has been found that these quick-change temporary lines are effective when a series of operations is required to be performed on three or four presses and production quantities per run are between 5,000 and 20,000 pieces. When quantities are of the order of 15,000 to 20,000 pieces, however, the advisability of using a progressive die is carefully investigated.

The basic advantages of the method are improved output rates and the avoidance of intermediate storage problems. Materials handling is an important consideration in this particular plant because of the volume of production, and the bulky nature of many of the parts. Metal chutes placed between the presses enable the parts to be passed from one machine to the next at die level, and unnecessary work handling and inconvenience to the operators are thus eliminated.

A group incentive payment scheme devised by the company has proved particularly advantageous in connection with these press lines. After the first few pieces of a batch have been produced by the setter, and accepted by the inspection department, the press line is handed over to the team of operators. During the run, hourly checks are made of the size of the part, to determine if the die is sufficiently sharp to continue in use. Often, with press line work, some operations can be performed at much faster rates than others. In such instances to ensure economy, and a smooth flow of work, fewer operators are employed, and they move from press to press, as required. When a production run has been completed, the last part made is compared with the first, to ascertain the final condition of the die.

The temporary press line seen in Fig. 2 provides for four secondary single-die operations on a switch box made from 16-gauge cold-rolled steel. Initial operations are carried out in a progressive-die, set up on a 300-ton Verson press. Coil material, 8¼ in. wide, is fed to the die, which progressively notches four corners, punches eight ⅛-in. diameter holes, punches and embosses key holes and mount-

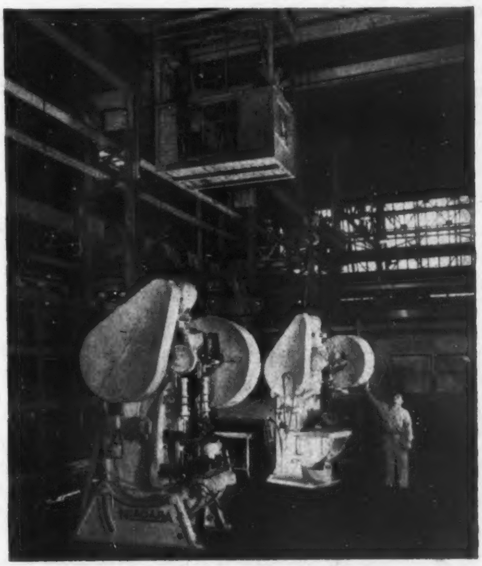


Fig. 3. Moving a press by means of an overhead travelling crane, to a new position in a production line

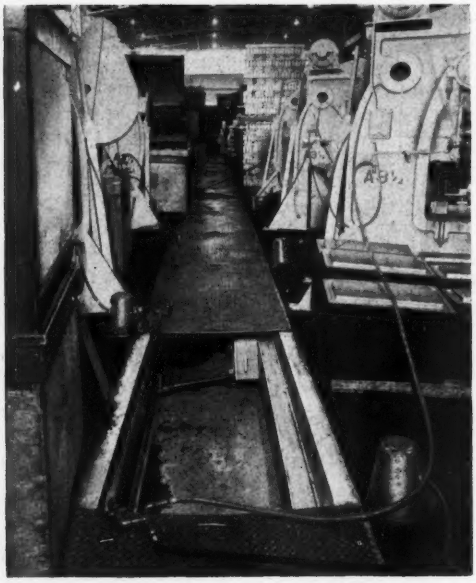


Fig. 4. View of the under-floor trench system which houses compressed air lines and plug-in bus-bar points for the electrical power supply

ing holes, and, at the final stage of the tool, flattens, cuts off, and forms each component.

For the secondary operations, the first press in the temporary line is set up to pierce four holes of 0·265 in. diameter, and produce two plunged holes which are subsequently tapped No. 10-32. The die in the second press punches one hole, and the die in the third press, the cover catch holes and two $\frac{3}{16}$-in. diameter holes. At the final operation, two hinge slots are pierced.

AUTOMATIC CLEANING, PHOSPHATE-COATING AND PAINTING LINE

After the various enclosure components have been spot welded together, they pass, together with certain products from other departments of the company, to a continuously-operating automatic cleaning, phosphate-coating, and painting line, with many advanced features. Components such as circuit-breaker panels and cover plates are first loaded by hand, from skids or boxes, on to specially-designed hangers, as seen in Fig. 5, in such a manner as to permit maximum drain off of paint and other fluids that are applied during processing. The hangers are spaced 18 in. apart on the overhead conveyor.

From the loading station, the conveyor enters a 5-stage spray-cleaning and coating installation supplied by the Detrex Corporation, Detroit 32, U.S.A. The parts are first pressure sprayed with a 2 per cent solution of Oakite No. 96 (Oakite Products Co., Inc., New York, 6) at a temperature of 160 deg. F. for precleaning, and this treatment is followed by hot water rinsing. At the third stage, a solution of Oakite CrysCoat No. 89 (iron-phosphate coating material) is sprayed on to the parts, which then enter a cold water rinse. Finally, the work is rinsed in a solution of Oakite No. 31, maintained at a temperature of 160 deg. F., for the purpose of improving the corrosion resistance of the phosphate coating, and providing for better paint adhesion.

On leaving the last stage of the Detrex unit, the conveyor carries the parts through a drying oven maintained at 375 deg. F., where all moisture is removed before the paint is applied. In Fig. 6, the upper portion of the conveyor is carrying parts to the Detrex unit for cleaning and phosphating, while parts on the lower conveyor are emerging from the drying oven.

For painting, the conveyor immerses the parts in a 1,500 gal. tank of paint, from which samples are taken hourly to check the viscosity and colour. The latter is corrected by additives whenever necessary, since a constant colour is important to ensure

Fig. 5. Loading circuit-breaker panels and cover plates on to the paint line conveyor. Specially-designed hangers are provided, which permit the paint and other applied liquids to drain off

Fig. 6. In this view, panels on the top section of the conveyor are moving to the spray-cleaning installation, on the lower section, phosphate-coated parts are emerging from the drying oven on the way to the dip-painting tank

matching when parts which may have been painted at widely-spaced time intervals are assembled together, or are placed adjacent to each other.

The paint is maintained at a constant temperature, which is a contributory factor in ensuring correct matching of colour on all parts regardless of when they are painted. Baking is the last operation before unloading, and is carried out in an oven at a temperature of 340 deg. F., through which the parts are conveyed in about 9 min. The overall length of the conveyor system is approximately 1,000 ft., and the work travels from the loading to the unloading station in about one hour.

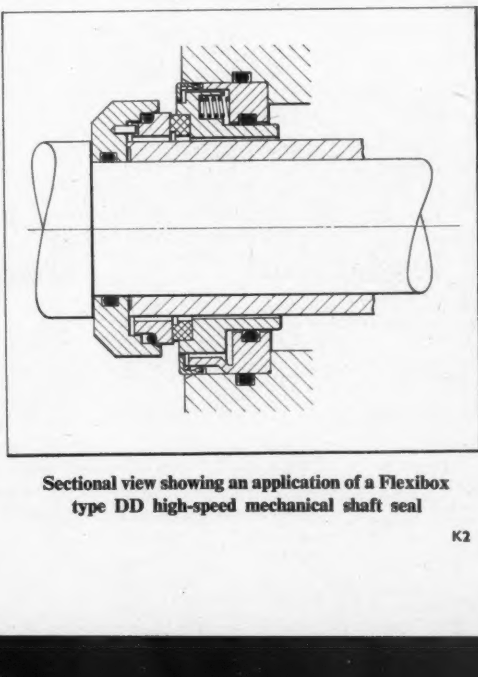
All operations performed on the line are regulated automatically from a central control console. In case of fire, it is only necessary to press an emergency control button to disconnect the electrical power. At the same time, a valve is automatically opened to empty the contents of the paint tank into a special outdoor storage tank. A carbon-dioxide foam blanket is applied automatically to the entire area when the temperature rises above a certain figure.

Flexibox Type DD High-speed Mechanical Shaft Seal

The type DD mechanical shaft seal, which has been introduced by Flexibox, Ltd., Nash Road, Trafford Park, Manchester, 17, will withstand pressures and temperatures up to 1,000 lb. per sq. in. and 500 deg. F., and is primarily intended for use where the space available in the axial direction is restricted and high peripheral speeds—up to 15,000 ft. per min.—are involved. Various standard sizes can be supplied, to suit shafts from ¾ to 8 in. diameter, and larger units can be made, if required.

Arranged for press fitting in a recess in the casing through which the shaft projects, the unit is designed for inclusion in a balanced system, and incorporates a sleeve, which is resiliently mounted in a housing by means of packing and does not rotate. The sealing ring is carried at the flanged left-hand end of this sleeve, and is shown cross-hatched in the accompanying sectional view. Compression springs, housed in pockets spaced around the rear face of the flange, engage an annular face on the housing and serve to urge the sleeve to the left, to maintain the sealing ring in contact with the opposing rotary seat. With this arrangement, it is claimed, uniform pressure between the ring and the seat is ensured.

Units of three types can be supplied, namely reverse balanced, and with O-rings or chevron packings for the sleeves, and there is a choice of two axial tolerance ranges, and three face loadings.



Sectional view showing an application of a Flexibox type DD high-speed mechanical shaft seal

Westool-Sonac Sensing and Switching System

A new sensing and switching system, known as the Westool-Sonac, with which an ultrasonic sound beam is employed, is now available from Westool, Ltd., St. Helen's, Auckland, Co. Durham. This system was developed by the Delavan Mfg. Co., West Des Moines, Iowa, U.S.A., and it is expected that it will find wide application in industry for automatic counting at rates up to 1,000 counts per min., package routing, level control, positioning, sorting, and many other control operations.

There are three major parts, namely a control unit which contains a transistorized amplifier, a plug-in output relay and a power supply; and two hermetically-sealed, acoustic sensors, as seen in Fig. 1. The two matched sensors convert electrical energy to ultrasonic energy and vice versa, one sensor acting as a transmitter and the other as a receiver to provide circulation around a closed loop.

It is stated that the system will detect solids or liquids, opaque or transparent objects, and ferrous or non-ferrous metals. Objects may be fast or slow moving, and at a wide range of distances. Moreover the beam can be made several feet wide or directed through holes down to about 0·030 in. diameter. A beam will follow almost any path as long as there is not direct obstruction. The units can therefore be remotely located, and the ultrasonic beam can be transmitted to the work area through flexible tubing, and, if necessary, caused to pass round corners.

With the Sonac system, one sensor is connected to the amplifier and operates essentially as a loudspeaker. This transmitting sensor produces ultrasonic waves of the quantity and frequency delivered to it by the amplifier. The other—receiving—sensor, is connected to the amplifier as a microphone and will deliver to it, as electrical energy, any ultrasonic vibrations that reach the diaphragm. The amplifier is capable of amplifying the weak vibrations fed to the receiving sensor more than 1,000,000 times.

The Sonac sensors are by design definitely directional in their response to ultrasonic waves. If the transmitting and receiving sensors are positioned facing each other, and the path between them is unobstructed, and the electrical gain in the amplifier is sufficient to overcome the losses in ultrasonic energy across the path, "acoustic feedback" will occur. If the gain control of the amplifier is set just sufficiently high to overcome the path loss between the sensors, and some object capable of absorbing or reflecting some of the ultrasonic energy is placed in the path, the electrical gain becomes insufficient to maintain the "acoustic feedback" on account of the larger loss in the path. This change in condition causes the control relay of the amplifier to operate, and some external device may thus be energized to initiate a secondary operation. The direct path method can also be employed for sensing the removal of an object from the beam. With the object obstructing the beam, the output relay is de-energized. When the object is removed, the acoustic path is completed, and the relay is energized.

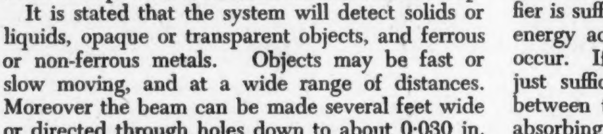


Fig. 1. The transistorised amplifier and relay unit, and two hermetically-sealed acoustic sensors for the Westool-Sonac sensing system

When the acoustic characteristics of the air path are changed by variations in temperature, relative humidity or standing wave conditions, the Sonac system adjusts itself to some new frequency which is optimum for the path conditions then prevailing.

To avoid interference by sounds or vibrations from other sources, the sensors are designed to operate only over a narrow spread of frequencies in the 38,000 cycles per sec. range. Each pair of sensors supplied with

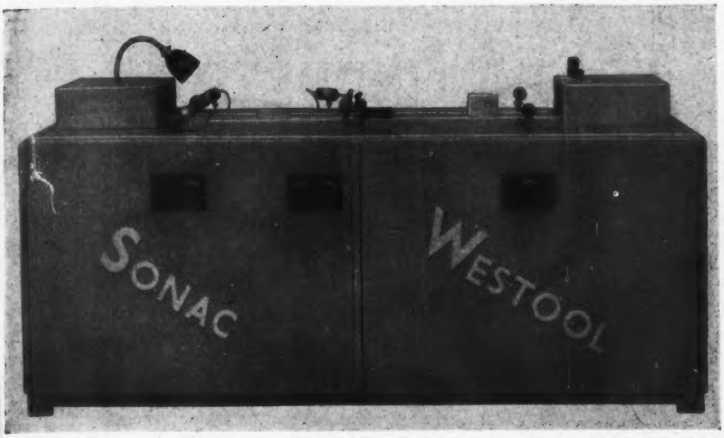


Fig. 2. Demonstration unit which shows the operation of the Sonac sensing and switching system now available from Westool, Ltd.

Sonac equipment is matched within ± 20 cycles and they must be used as a pair. To permit operation of several Sonac devices in close proximity, matched sensor pairs are supplied which have different frequency characteristics so as to avoid interference between the systems. The sensors, which are all metal, and hermetically sealed, measure $1\frac{3}{8}$ in. diameter by $2\frac{1}{16}$ in. long, and can be used at temperatures from $+220$ to -350 deg. F.

Two modified sensors, known as the coupler, and the focalizer, are available for specialized applications. The coupler sensor reduces the ultrasonic waves down to a small area for transmission through flexible rubber hose or metallic pipe, to reach locations too confined for the application of general-purpose sensor installations. The focalizer sensors incorporate parabolic reflectors to provide beams of narrower angle than those transmitted by general purpose units. They are intended for applications that require beam paths of more than 20 ft., or narrow concentration of the beam in paths of less than 20 ft.

In addition to direct-path, the sensors can be arranged for operation with a reflected path. With this method, the ultrasonic waves emitted from one sensor are reflected from an object to the second sensor, to provide the acoustic path. When the object is removed from the path, the relay is de-energized. Conversely, the relav is energized when an object establishes the path. The reflection method, it is stated, is particularly suitable for counting or sensing small objects.

A specially-built demonstration unit, which illustrates the operation of the system, is seen in Fig. 2.

Three pairs of sensors are fitted along a continuous belt conveyor. The pair on the right is arranged for counting boxes in very dusty and dirty conditions provided by a dust sprayer fitted beside the belt. At the centre, there is a pair arranged to sense for height. When a box passes which is higher than the remainder on the belt the beam is broken and a solenoid is operated. The third pair, on the left, operates in conjunction with a flashing light.

Among the main other applications of the system may be mentioned the guarding of presses and other machinery, level control in bins and hoppers, and detection of web breakage.

The Attitude of Small and Medium-sized Firms to Export Trade

(*Continued from page* 347)

is involved or how to set about it." The point which it is essential to grasp, the authors continue, "is that in practically no case have we found any evidence that a firm which really wanted to export would find any serious difficulty in doing so."

Enquiries also revealed that there were striking differences of opinion on certain matters between managing directors of exporting and non-exporting companies. Those who exported had found that they could easily get export information, that the Board of Trade was helpful, and that ignorance of foreign languages was no barrier to trade. On the other hand, many non-exporters gave these as their principal reasons for not entering markets abroad.

In the circumstances, it is not difficult to understand why those responsible for the survey suggest that it may "possibly be more immediately effective to concentrate on encouraging those firms which already export to export more." At the same time it appears that the non-exporters could collectively contribute very substantially, if they wished, to the rapid expansion of export trade, and there is plenty of evidence that "the self-interest of the individual manufacturer and the long-term interests of the national economy can both be served by greater attention to the possibilities of export."

NEWS OF THE INDUSTRY

Keighley

HEWITT & TOPHAM, LTD., Foster Road, Ingrow, who are specialists in gear production, report an exceptionally heavy demand from an increasing number of customers in a wide variety of industries. The company supplies worm gears up to 12-in. centres, spur gears up to 48 in. diameter and bevel gears up to 25 in. diameter.

There is an exceptional strong request at present for various bevel driving units and worm reduction units, the latter covering a ratio range from 10:1 up to 60:1.

❖ ❖ ❖

This Archdale special purpose deep hole drilling machine is installed in the line for 3-cylinder crankshafts at the works of F. Perkins, Ltd., Eastfield, Peterborough. It is one of two employed for drilling the oil holes connecting the main bearing journals with the crankpins. Loaded with the flywheel flange at the top, the crankshaft is secured by three clamps, two of which also provide for location. The drill heads withdraw automatically after each $\frac{1}{16}$-in. of feed, for swarf clearance, and a thrust and torque overload device is incorporated which ensures withdrawal of the drills if they should stick or encounter any obstruction. Drilling is completed in a cycle time of 6 min.

WARD, HAGGAS & SMITH, LTD., Parsons Street, report a steady demand for their range of machine tools. It was noted that a substantial volume of orders and enquiries is at present being received from the Admiralty, that a repeat order is in hand for a large planing machine for export to Pakistan, and that other machines on order for export include a number for delivery to Singapore.

DEAN, SMITH & GRACE, LTD., inform us that the call for their range of machine tools, which includes centre lathes from 13- to 32-in. swing, surfacing and boring lathes from 16- to 24-in. swing, and a 17-swing capacity toolroom lathe, is being well maintained. Special mention is made of the increasing number of orders for lathes having built-in copying units. Comprehensive catalogues of copying lathes and equipment have been produced, and copies are available from the above address. New plant recently installed in the works includes an Alfred Herbert type F hexagon turret drilling machine; two B.S.A. No. 5.M. single-spindle automatics; a Keighley internal grinder with a capacity of 16 in. diameter by 4 ft. long; and a Cincinnati duplex Hypowermatic milling machine.

A. FIELDING & CO. (KEIGHLEY), LTD., Airedale Works, Bradford Road, are busy with the production of their 16- and 18-in. swing centre lathes. We are informed that a good volume of orders is in hand at present, and that approximately 50 per cent of the output is being regularly exported, India and Nigeria being mentioned as two of the main export customers.

Work now in progress includes two special-pur-

pose lathes equipped with rear tool-posts, and it was noted that this company also undertakes the construction of special-purpose machine tools and equipment, on a contract basis, to the individual requirements of customers.

CHARLES DALE & CO., LTD., East Parade, makers of special machine tools and equipment to customers' specifications, report that all departments of their works are extremely busy. This company also undertakes the contract machining of a wide variety of components for various branches of industry, including machine tool, mechanical handling equipment, and foundry equipment manufacturers, and the motor car trade. We are informed that delivery of a Scharmann, 3⅛-in. diameter spindle, horizontal boring and milling machine is expected shortly.

N. HARGREAVES & CO., Luton Street, Keighley, are busy with the production of machine tools on a contract basis. Other activities of this company include reconditioning and general maintenance, for the local engineering industry, of all types of machine tools and equipment. This company has lately installed a number of machine tools, and the more recent additions to the plant have included Kitchen & Wade E. 25. 3-ft. and T.7. 32-in. radial drilling machines; Victoria U.2. and U.0. milling machines; and a Zimmermann horizontal borer.

R. SUTCLIFFE.

Leicester

ELLICOCK & HEALY, LTD., Dorothy Road, have made arrangements for increasing the output of precision parts, jigs, fixtures, and gauges from their works, by providing additional floor space and installing new machine tools, including two Willson 8½-in. centre lathes, a Kitchen & Wade radial drilling machine, and a Ward No. 2A capstan lathe. Work in progress, to which our attention was drawn, includes gauges and fixtures for gas turbine parts, and components for nuclear energy equipment. This company, which is A.I.D. and A.R.B. approved, has also specialized for a number of years in the building of sanding, polishing and disc-grinding machines, arranged for bench or floor mounting. Both types are provided with 16-in. diameter abrasive discs, and can also be employed for fine or coarse sanding operations. Grinding discs of honeycomb face pattern may be employed to obtain increased rates of stock removal. If required, these machines can be provided with self-contained dust collecting equipment. They are widely employed for operations on metals, plastics, rubber, stone, and wood.

MARWIN (ANSTEY), LTD., Anstey, who make an extensive range of tungsten-carbide tipped tools, are still well placed for orders for most of their standard products, including a wide variety of tools for turning, boring, shaping, and planing operations; die sinking cutters; end mills; shell face milling cutters; inserted blade face mills up to 16 in. diameter; reamers with replaceable cutting ends; Chuckmill face mills, which are designed for fitting to existing types of end-mill chucks with the aid of a patented adapter; and side-and-face milling cutters. The company also builds double-ended dual-speed grinding and lapping machines, for bench or pedestal mounting, which may be fitted with silicon carbide wheels, Carbolap wheels, or diamond wheels, as required.

A 9,000-sq. ft. extension to the works, which is expected to be ready for occupation after the

❖ ❖ ❖

Birmingham Sound Reproducers, Ltd., have installed some 30 dynamic balancing machines in their factories at Old Hill, Staffs., and Londonderry. These machines, which were supplied by E.M.I. Electronics, Ltd., Hayes, Middlesex, are employed for balancing the rotors for driving motors for record changers and tape decks. The motors run at 3,000 r.p.m. and accurate balance is important, to reduce "rumble" and "flutter" as much as possible. On the E.M.I. machines balancing is carried out to an accuracy of 10 mg.-cm. by semi-skilled girls, after suitable training

holiday period, will enable the output of Marwin cutting tools for delivery to the home market and to a growing number of overseas customers to be substantially increased. Two form-grinding machines and a new induction heating plant have recently been installed.

TAYLOR, TAYLOR & HOBSON (a division of Rank Precision Industries, Ltd.) are experiencing a brisk demand for their various products, including Talysurf surface roughness measuring and Talyrond roundness measuring equipment. The Model 2 version of the latter will accept work up to 50 in. long by 10 in. diameter and is employed in the motor vehicle industry abroad for checking crankshafts, camshafts, and half-shafts. Developments are in progress to increase the length of stylus arm from 10 in. to 15 in. without adversely affecting the existing radial magnification. The type 105 Talysurf portable surface measuring instrument is suitable for measuring bores down to ¼ in. diameter and 11 in. long.

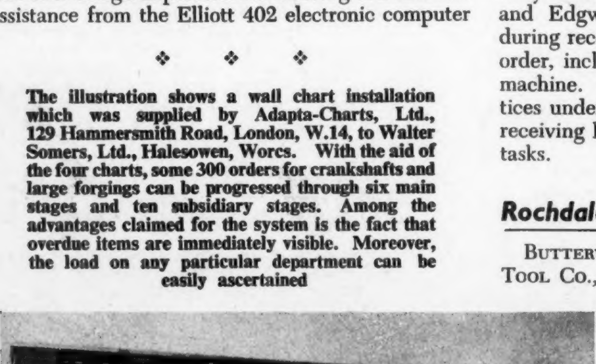
Varotal type 3 dual-range television camera "zoom" lenses are now in production, for supply to broadcasting organizations at home and overseas. The lens design department is deriving considerable assistance from the Elliott 402 electronic computer which was installed in order to facilitate calculations associated with optical equipment. It is claimed that the speed and accuracy of this computer is such as to enable routine ray tracing calculations, for example, to be completed in 1/200th of the time required previously, when traditional methods were employed. Machine tools recently installed in the shops have included a Ward No. 2 DS capstan lathe, a Tarex 90/90 automatic, a B.S.A. 168 L automatic with a thread chasing attachment, and a Upam bandsawing machine with automatic stock feeding equipment.

A. A. JONES & SHIPMAN, LTD., Narborough Road South, are as busy as ever in meeting the demand from home and export markets for a wide range of grinding machines, mainly of production types. Orders for Micromatic honing machines are stated to be satisfactory, and there is sustained activity in the machine tool agency department, machines recently ordered having included a slideway grinder built by Familleureux-Giddings & Lewis. Business is also well maintained in the small tools section. A works extension of 25,000 sq. ft. area is to be built and it is expected that it will be occupied early next year. A number of Ward capstan lathes and Edgwick centre lathes have been installed during recent months. Other machine tools are on order, including a slideway grinder and a planing machine. The company has a number of apprentices undergoing training, and other employees are receiving limited instruction to fit them for specific tasks.

F. W. HERRIDGE.

❖ ❖ ❖

The illustration shows a wall chart installation which was supplied by Adapta-Charts, Ltd., 129 Hammersmith Road, London, W.14, to Walter Somers, Ltd., Halesowen, Worcs. With the aid of the four charts, some 300 orders for crankshafts and large forgings can be progressed through six main stages and ten subsidiary stages. Among the advantages claimed for the system is the fact that overdue items are immediately visible. Moreover, the load on any particular department can be easily ascertained



Rochdale

BUTTERWORTH BRITISH AUTOMATIC MACHINE TOOL CO., LTD., Lincoln Street, are busy with the production of their range of automatic machine tools, and it may be noted that a considerable volume of special tooling is regularly being designed and made to suit customers' requirements.

We are informed that a steady export trade in machines and equipment is being maintained, and that Australia is one of the principal customers at present.

DAVID BRIDGE & CO., LTD., Queensway, Castleton, report that they are working to full capacity, their exclusive range of machinery for the plastics, rubber, and associated industries being in keen demand. The company is now exporting to many overseas markets, including the

U.S.S.R., and work has recently begun on a large contract for Rumania.

To enable output to be increased a works re-organization scheme is in progress which includes the erection of a new assembly bay. This extension, which is now nearing completion, covers an area of some 21,000 sq. ft., and is of sufficient height to provide 30 ft. of headroom beneath the cranes.

L. E. Wilson (Die Casting), Ltd., Trows Works, Trows Lane, Castleton, inform us that they are extremely busy with the production of a wide variety of gravity die castings in both aluminium and aluminium-bronze. It may be noted that there has been a large increase in recent months in the volume of new work handled, mainly for the electrical equipment and food processing machinery industries. Capacity has been increased by the installation of two small pressure die casting machines for zinc-base alloys. The tool-room, in addition to producing dies for use in the foundry, undertakes die-making on a contract basis for other companies.

Taylor Industrial Clutches, Ltd., Upper Trows Works, Castleton, are experiencing an increasing demand for their range of wet and dry multi-plate clutches and brakes. In addition, many orders are being received for pneumatically- and hydraulically-operated clutches and brakes for use on presses. The standard range covers capacities from 50 to 500 tons, and special types can be supplied for presses with ratings up to 2,000 tons.

There has been a steady increase in the volume of direct export orders received in recent months, and in particular, many mechanical clutches are being supplied to India for use on machine tools.

Tweedales & Smalley, Ltd., Castleton, makers of machines and equipment for the textile industry, report a sustained call for their products from both the home and export markets. The foundry, which has been partly mechanized, is maintaining an output of approximately 90 tons of ferrous and non-ferrous castings per week.

Industrial air-conditioning and refrigeration plant, and passenger and freight lifts, are now in regular production in the new works extension.

Frost (Rochdale), Ltd., Crawford Street, Rochdale, inform us there is a steady demand from customers at home and overseas for their range of machines and equipment. Work in progress at the time of our visit included adjustable circular shearing machines, folding machines, and plate bending rolls, also treadle and overcrank guillotine shears of various sizes.

Turner Brothers Asbestos Co., Ltd., Spotland, are experiencing a heavy demand for all their products, including asbestos textiles of various types, conveyor belting, and transmission belting of both flat and vee forms. Particular interest is being shown in the recently-introduced Poly-Vee drive units.

John Holroyd & Co., Ltd., Milnrow, inform us that their ranges of single- and double-reduction units are in keen request at the present time, and that a steady volume of orders is being received by the contract gear cutting department. The demand for milling machines, and especially for the rotor milling type, is being well maintained both at home and abroad. An increasing call is also reported on the company's services as rotor milling specialists, by customers in many parts of the world.

R. Sutcliffe.

Mapperley Engineers, Ltd.

The first stages of an expansion programme have recently been completed by Mapperley Engineers, Ltd., Haywood Road, Mapperley, Nottingham, with the transfer of plant to a new machine shop, as shown in the accompanying illustration.

A view in the new machine shop which has recently been occupied by Mapperley Engineers, Ltd.

This company took over a small precision and repetition engineering business in 1951 for the purpose of producing components under sub-contract. About two years ago it was decided to purchase additional plant and to plan for production on a larger scale, and it is reported that output has been increased by 100 per cent since the beginning of 1960. With the new shop and plant in operation, it is hoped to expand production by a further 50 per cent during the next 12 months. Hitherto the capacity of the works has been heavily taxed, but with the improved facilities now available, more repetition work can be accepted.

At present, components of wide variety are being produced, for example, for motor vehicles, agricultural and hosiery machines, and domestic electrical appliances.

Demonstrations to be given in Brussels

A Tracemaster type TM43A 3-dimensional copy milling machine built by Hayes Engineers (Leeds), Ltd., and 18- and 26-in. stroke Super shapers from the range made by the Butler Machine Tool Co., Ltd., Halifax, member companies of Associated British Machine Tool Makers, Ltd., 17 Grosvenor Gardens, London, S.W.1, will be demonstrated throughout the period of the 7th European Machine Tool Exhibition, to be held in Brussels from September 3 to 12, at the showrooms of Société d'Importation de Machines-Outils S.A., 90 Avenue Clémenceau, Brussels-Midi. The latter company is the agent in Brussels for A.B.M.T.M.

Industrial Notes

An Auction Sale of Vehicles, Machine Tools and miscellaneous stores will be held at the W.D. Storage Depot, Bow House, Hurlford, near Kilmarnock, Ayrshire, on August 24. The auctioneers will be Dixon & Wallace, Ltd. (Dept. L), Bank Buildings, Graham Square, Glasgow, E.1.

Accidents—How They Happen.—The latest issue of this H.M. Factory Inspectorate Publication (H.M. Stationery Office. Price 1s. 3d. net) describes typical accidents under the headings handling, transport, process machinery, and electricity, and suggests how they might have been avoided.

Thor Tools, Ltd., Special Products Department, Tynemouth, Northumberland, have introduced a service which provides for the design and construction of special multi-spindle attachments for application to obsolete drilling, nut-running, tapping, and stud-setting machines, to enable them to be employed efficiently. It is stated that estimates are supplied without obligation.

The Institute of Service Management, 68 Church Avenue, Pinner, Middlesex, announce that S. N. Bridges & Co., Ltd., have become the first "patron company" of this newly-formed organization. It is stated that the membership, as a result of the most recent applications, has now increased to 50, and includes manufacturers of canteen equipment, domestic appliances, power tools, and electronic and radio equipment.

Safety in the Use of Ionising Radiations, a safety code for workers exposed to ionising radiations in industry is laid down in the Ionising Radiations (Sealed Sources) Regulations, 1961 (S.I. No. 1470, H.M. Stationery Office. Price 9d. net), made by the Minister of Labour, Mr. John Hare, and presented to Parliament on August 3. Most of the requirements will come into operation in six months' time, but those requiring the notification of the use and disuse of ionising radiations in factories are now effective.

Department of Scientific and Industrial Research, Charles House, 5-11 Regent Street, London, S.W.1, have issued a 12-page booklet entitled "Instruments in the Factory," by J. Thomson, in which attention is drawn to the advantages to be gained from the use of suitable instruments for the control of various industrial processes. There are sections entitled: simple instruments save money, how it is done, factory instrumentation, from "watch-keeping" to automatic control, improvements in your product, and cutting the cost.

F. J. Stokes, Ltd., Mercury House, Hanger Green, Ealing, London, W.5, announce that they are now able to supply the new type 725, air-operated, automatic transfer moulding press, of 25 tons capacity, which has been introduced by the Plastics Moulding Division of the parent company, F. J. Stokes Corporation, Philadelphia, U.S.A. These presses, which will be built for the company by Thomas White & Sons, Ltd., Paisley, are of simple design and are intended to enable fully automatic moulding to be economically employed for short production runs with inexpensive moulds.

British Iron and Steel Federation, Steel House, Tothill Street, London, S.W.1, have issued a publication entitled: "Steel in the 1960's—Developments by the Companies." Including some excellent illustrations in full colour, this publication is in two parts, the first being concerned with major developments by leading steel producing companies, and the second with the implications of the programme. In the latter part, separate sections are devoted to mill developments and products, "the revolution in steelmaking," and ironmaking and raw materials.

Giddings & Lewis Machine Tool Co., Fond du Lac, Wisconsin, U.S.A., recently reported that new orders booked during the six months ended July 31 were at an annual rate which was one-third higher than the rate for 1960 and that "present sales activity was most encouraging." In a statement to shareholders, the president and general manager, Mr. Ralph J. Kraut, remarked that whereas shipments for the second half of the year were expected to show a substantial increase over those for the first half, more than 50 per cent of all shipments this year would be accounted for by completely new and numerically controlled machines—with costs highly unpredictable and variable. He also indicated that it was intended to continue and accelerate the research and development programme in which the company has been engaged for some time.

Books Received

BRITISH NUCLEAR POWER STATIONS. By Rolt Hammond, A.M.I.C.E. Macdonald & Co. (Publishers), Ltd., 16 Maddox Street, London, W.1. 182 pp. [Price 25s. net.]

In this non-scientific survey of the present position as regards the development of atomic power in this country, attention is drawn to the economic implications of its introduction, and an attempt has been made to forecast future extensions. Chapters are devoted to the Calder Hall, Hinkley Point, Berkeley, and Hunterston projects, and others are concerned with the design of nuclear stations, research, the Dounreay sphere, and thermonuclear power.

HEAT TREATMENT AND PROPERTIES OF IRON AND STEEL. By Thomas G. Digges and Samuel J. Rosenburg. U.S. Department of Commerce, National Bureau of Standards, Washington 25, D.C., U.S.A. [Price 45 cents.]

This monograph (No. 18) of 40 pages covers, in simplified form, the basic theoretical and practical principles involved in the heat treatment of iron and steel. The effects of the various treatments on the structures and mechanical properties are described, but some theoretical aspects and technical details are discussed only briefly, or omitted entirely, to enable a better understanding of the subject as a whole to be obtained. A list of all structural, tool and stainless steels in use in the U.S.A. is included, together with recommendations for heat treatments.

DIRECT CURRENT MACHINES. By H. B. Ranson, B.Sc., A.M.I.E.E., A.M.Brit.R.E., and E. T. A. Webb, A.M.I.E.E. Cleaver-Hume Press, Ltd., 31 Wright's Lane, London, W.8. 320 pp. [Price 21s. net.]

Although alternating current has many practical advantages, notably as regards transmission and transformation, there are many applications of electric power for which only direct current is satisfactory. The authors emphasize this fact and have covered, in a relatively small space, all the most important aspects of direct-current machines, including design, construction, performance characteristics, and control. Treatment is largely non-mathematical, although certain fundamental formulae are used in the accompanying arithmetical examples. The book is to be recommended as an excellent introduction to the subject, and for purposes of practical reference.

CHIPLESS MACHINING. By Charles H. Wick. The Industrial Press, New York. The Machinery Publishing Co., Ltd., National House, West Street, Brighton, 1. 502 pp. [Price 90s. net.]

Methods of forming metal to the required finished shapes without the production of chips are receiving increasing attention and are being more widely adopted by the metal-working industries on account of the savings in cost that can thus be obtained. The author of this book has brought together the relevant data already available, to provide a useful practical guide. Processes covered include cold heading; the rolling of threads, serrations, splines, and gears; power spinning; rotary swaging; cold forming; and cold extrusion; also explosive and other high-energy-rate forming methods. Much space has been devoted to the cold extrusion process, and matters discussed include the selection of material, design of parts, phosphate coating and lubrication, die design, and choice of press.

Personal

Mr. A. H. (Jack) Daniel has recently retired from George Kingsbury & Co. (Machine Tools), Ltd., 54 Victoria Street, London, S.W.1. Mr. Daniel has been associated with the British agents for Index automatics for more than 35 years.

The following new appointments have been announced:—

Mr. R. C. Thompson, C.B.E., M.A., and Mr. J. F. Butler, M.A., A.M.I.Mech.E., as directors of William Doxford & Sons (Engineers), Ltd., Pallion, Sunderland.

Mr. G. F. Laurence, director of technical services for Metalastik, Ltd., Evington Valley Road, Leicester, as a deputy managing director of the company.

Mr. N. D. Macdonald, general works manager of the Workington Iron & Steel Co. branch of The United Steel Companies, Ltd., The Mount, Broomhill, Sheffield, 10, as a director of the branch.

Mr. H. F. Sherborne, M.C., managing director of Yorkshire Imperial Metals, Ltd., P.O. Box No. 166, Leeds, as president of the British Non-Ferrous Metals Federation, in succession to Mr. W. W. Dolton, managing director of the Delta Group of companies. Mr. Sherborne represents the Federation on the Council of the British Non-Ferrous Metals Research Association.

Trade Publications

Allen West & Co., Ltd., Lewes Road, Brighton 7. Illustrated leaflet describing the new Type UAC range of unit contactors which are available in ratings of 15, 25, and 50 amp.

Telephone Rentals, Ltd., 197 Knightsbridge, London, S.W.7. Leaflet drawing attention to the TR internal telephone, internal broadcasting, time control, machine performance recording, fire alarm, and fire detection systems.

Morganite Carbon, Ltd., Battersea Church Road, London, S.W.11. Issue No. 2 of the technical Bulletin "Carbon and its Uses" includes a detailed article on a new approach to brush pressure measurement, and another on the advantages, design, and applications of carbon seals. Carbon electrical contacts are also discussed, and attention is drawn to some interesting new applications of carbon.

Croda, Ltd., Cowick Hall, Snaith, Goole, Yorkshire. Revised technical data sheet covering anti-corrosive and other protective materials manufactured by the company to Government and other official specifications. Another data sheet is concerned with Prevok general purpose rust preventive which provides a solvent deposited film of protective material. This film, it is stated, is soft but tenacious.

Trumeter Co., Ltd., Milltown Street, Radcliffe, Manchester. Fully illustrated catalogue describing the Trumeter range of revolution counters, stroke counters, and yardage counters. Printing counters are also listed, together with electro-magnetic counters and various types for special applications. In all, reference is made to more than 40 different forms of counting instruments in the 14 sections of the catalogue.

C. E. Johansson, Ltd., Southfields Road, Dunstable, Beds.—Second edition of the company's pocket-size booklet, entitled "CEJ Screwing Taps and their Use." In general only minor changes have been made, but attention may be drawn to the inclusion of the ISO-Metric and Unified thread recommendations. A great deal of useful information is conveniently presented and there is a list of contents to facilitate reference. Apart from notes on such subjects as through holes, cutting rakes, regrinding, lubricants, tap zones, tap nomenclature and thread designations, sections are devoted, for example, to diameters and pitches, thread depths, tapping drills, and basic forms and tap tolerances for the principal types of threads.

Scrap Metals

†London.—‡Prices per ton for non-ferrous scrap metals free from iron are as follows:—Clean copper wire, untinned and free from lead and solder, £200; clean heavy copper, untinned and free from lead and solder, £194; copper wire No. 2, £190; clean light copper, £186; braziery copper, £163; gunmetal, £174; brass, mixed, £126; lead, net, £51; zinc, £40; cast aluminium, £93; old rolled aluminium, £96; battery lead, £26; unsweated brass radiators, £102; hollow pewter, £565; black pewter, £445.

Midlands.—Trade is quiet generally, since many work, are closed for annual holidays. In connection with coppers uncertainty has persisted, and when normal trading is resumed this metal is still likely to be viewed with a certain amount of caution, unless any interruption in production causes concern and a resultant increase in price.

Tin is still in strong demand and some doubt regarding supplies has resulted in a rise in market value of about £10 per ton. The price of tin has of course been reflected in a better demand and price for white-metal scrap.

The position as regards various metals and alloys is as follows:—

Copper. Prices for most grades show little change.

Brass. Consumer demand is primarily for mixed heavy material, but all grades find ready outlets.

Gunmetal. Prices are firm with little change. Demand is good and this applies particularly to the high quality bronzes.

Lead. There has been a small easing in price on a slow market, which appears to be affected only by demand, production being ample to meet all requirements.

Aluminium. No marked changes in values has occurred. Buyers are very selective and obviously carry sufficient stocks to meet present requirements. A better price tone cannot be foreseen in the near future, with the motor car trade entering a period when production is usually at the lowest level.

Zinc. Demand is fairly steady, but prices have fallen by about £1 to £2 per ton.

† George Cohen, Sons & Co., Ltd., 600 Wood Lane, London, W.12
‡ Subject to market fluctuations.

Machine Tool Share Market

Stock markets were fairly active during the period under review, but after being mainly steady to firm, they became irregular, and most sections finished on a subdued note.

The gilt-edged sections suffered some sharp setbacks at the outset, but gradually rallied to end with some striking improvements among British Government stocks and kindred issues.

Commercial and industrial share markets displayed an upward trend for the most part under the influence of the Trustee Investments Bill which permits trustees to invest up to half their funds in equities.

Towards the close, however, an easier tendency developed owing to a falling off of the investment demand, and final prices were below the best.

Among machine tool issues, Arnott & Harrison advanced 3d. to 9s.; Birmingham Small Arms, 2s. to 23s. 6d.; Broom & Wade, 2s. 3d. to 24s. 9d.; Chas. Churchill, 3d. to 9s. 3d.; Clarkson Engineers, 1s. 6d. to 7s. 6d.; Coventry Gauge & Tool, 3s. 3d. to 29s. 4½d.; Craven Bros. (Manchester), 10½d. to 9s. 1½d.; Alfred Herbert, 3s. to 66s. 6d.; A. A. Jones & Shipman, 3s. 9d. to 27s. 6d.; Samuel Osborn, 2s. 3d. to 49s. 6d.; Ambrose Shardlow, 2s. to 60s.; John Shaw & Sons (Wolverhampton), 7½d. to 15s. 7½d.; and Thos. W. Ward, 6s. 3d. to 73s. 9d. On the other hand, British Oxygen lost 6d. at 20s.; Butler Machine Tool, 1s. 3d. at 15s.; John Harper, 7½d. at 7s.; B. & S. Massey, 1s. at 10s.; F. Pratt, 6d. at 17s. 9d.; and Sanderson Kayser, 3s. 1½d. at 29s. 4½d.

*New Companies Registered**

LAKE & ELLIOT FOUNDERS & ENGINEERS, LTD., and LAKE & ELLIOT JACKS & EQUIPMENT, LTD. Albion Works, Braintree, Essex. Registered July 20, 1961. To acquire the whole or any part of the undertaking and assets of Lake & Elliot, Ltd., and to carry on business of iron and steel founders, mechanical engineers, etc. Nom. cap.: £100 in £1 shares. Directors not named.

BRIDGWATER MACHINE CO., LTD. Registered July 21, 1961. To carry on the business of founders, converters, fabricators, extruders, forgers and manufacturers of iron, steel, aluminium and other metals, manufacturers of and dealers in machinery, equipment, tools, etc. Nom. cap.: £200,000. Directors not named. Subscribers: R. P. Broadley and D. M. Renshaw, 9/12 Cheapside, London, E.C.2.

* From the lists compiled by Jordan & Sons, Ltd., Company Registration Agents, 116-118 Chancery Lane, London, W.C.2.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	1/9
Allen (Edgar) & Co., Ltd.	Ord.	£1	37/-
" "	5% Prf.	£1	13/-*
Arnott & Harrison, Ltd.	Ord.	4/-	9/-
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	9/6
" " "	6% Cum. Prf.	£1	16/6
Birmingham Small Arms Co., Ltd.	Ord.	10/-	23/6
" " "	5% Cum. "A" Prf.	£1	14/-
" " "	6% Cum. "B" Prf.	£1	16/-
" " "	4% 1st Mort. Deb.	Stk.	92½
British Oxygen Co., Ltd.	Ord.	5/-	20/-
" " "	6% Cum. Prf.	£1	19/-
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	8/10½
Broom & Wade, Ltd.	Ord.	5/-	24/9
" "	6% Cum. Prf.	£1	16/6
Brown (David) Corporation, Ltd.	5½% Cum. Prf.	£1	15/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-
Butler Machine Tool Co., Ltd.	Ord.	5/-	15/-
" " "	5% Cum. Prf.	£1	12/6
Churchill (Charles) & Co., Ltd.	Ord.	2/-	9/3
" " "	6% Cum. Prf.	£1	25/7½‡
Clarkson (Engrs.), Ltd.	Ord.	5/-	7/6 ex capt.
Cohen (George), 600 Group, Ltd.	Ord.	5/-	11/3
" " "	4½% Cum. Prf.	£1	11/6
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	29/4½
" " "	5% Cum. Red. Prf.	£1	16/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	9/1½
Elliott (B.) & Co., Ltd.	Ord.	1/-	2/6
" "	4½% Red. Cum. Prf.	£1	12/-
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	10/-
Greenwood & Batley, Ltd.	Ord.	10/-	20/1½
Harper (John) & Co., Ltd.	Ord.	5/-	7/-
" " "	4½% Red. Cum. Prf.	£1	11/7½
Herbert (Alfred), Ltd.	Ord.	£1	66/6xd
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	20/-
" "	"B" Ord.	5/-	18/6
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	27/6
" "	7% Cum. Prf.	5/-	4/9
Kearney & Trecker-C.V.A., Ltd.	5½% Red. Cum. Prf.	£1	10/-
" " "	Prefd. Ord.	£1	13/9
Kearns (H. W.) & Co., Ltd.	Ord.	5/-	22/-
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	9/-
Macreadys Metal Co., Ltd.	Ord.	5/-	16/6
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
Massey (B. & S.), Ltd.	Ord.	5/-	10/-
Newall Engineering Co., Ltd.	Ord.	2/-	7/6
Newman Industries, Ltd.	Ord.	2/-	7/-
" "	6% Prf. Ord.	5/-	5/-
Noble & Lund, Ltd.	Ord.	2/-	6/-xd
Norton, W. E. (Holdings), Ltd.	Ord.	2/-	8/6
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	49/6
" " "	5½% Cum. Prf.	£1	22/-
Pratt (F.) & Co., Ltd.	Ord.	5/-	17/9
Sanderson Kayser. Ltd.	Ord.	10/-	29/4½
" "	6½% Cum. Prf.	£1	16/3
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	9/-
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	60/-
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	15/7½
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	19/3
" " " "	5% Cum. Prf.	£1	13/3
Stedall & Co., Ltd.	Ord.	5/-	7/3
Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	28/9
Tap & Die Corporation, Ltd.	Ord.	5/-	16/3
" " "	4½% Deb. 1961-1977	Stk.	82½
Wadkin, Ltd.	Ord.	10/-	26/-
Ward (Thos. W.), Ltd.	Ord.	£1	73/9
" "	5% Cum. 1st Pref.	£1	13/6
" "	5% Cum. 2nd Pref.	£1	20/-
Willson Lathes, Ltd.	Ord.	1/-	3/-

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. ‡ Birmingham price.

BRITISH MACHINE TOOL

Exports of New Machine Tools

Countries	Bar and Chucking Automatics		Vertical Boring Machines		Other Boring Machines		Drilling Machines		Gear-cutting Machines		Grinding, Lapping and Honing Machines		Capstan and Turret Lathes		Other Lathes	
	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £
Commonwealth																
South Africa	—	—	—	—	189 (1)	7,738	239 (21)	6,201	—	—	79 (16)	4,182	535 (10)	23,238	531 (16)	21,153
India	—	—	1,098 (1)	60,754	150 (5)	7,818	435 (5)	7,659	—	—	1,147 (39)	47,554	1,349 (14)	38,287	469 (5)	19,600
Pakistan	—	—	—	—	379 (3)	11,334	146 (3)	5,501	—	—	15 (2)	554	49 (2)	3,120	—	—
Australia	519 (5)	22,520	—	—	666 (4)	21,773	1,351 (52)	41,188	308 (15)	4,204	1,027 (21)	47,393	1,494 (38)	60,617	1,857 (83)	81,946
New Zealand	91 (1)	7,353	130 (1)	10,142	—	—	328 (18)	8,190	—	—	43 (6)	1,452	201 (5)	8,819	685 (39)	21,977
Canada	—	—	115 (1)	5,869	—	—	453 (9)	6,533	—	—	205 (10)	8,471	117 (2)	6,488	1,020 (5)	25,522
Miscellaneous	—	—	—	—	2 (1)	676	218 (39)	7,916	—	—	72 (24)	2,159	107 (4)	2,932	654 (28)	20,873
Foreign																
Soviet Union	—	—	157 (2)	20,112	—	—	42 (1)	4,050	67 (3)	6,235	110 (2)	9,952	—	—	—	—
Sweden	—	—	—	—	127 (2)	9,779	34 (3)	1,390	—	—	304 (13)	8,031	373 (9)	16,124	161 (27)	7,357
Norway	—	—	—	—	—	—	40 (1)	1,180	—	—	2 (1)	110	—	—	61 (3)	1,900
Denmark	—	—	—	—	—	—	195 (3)	5,496	—	—	—	—	55 (3)	2,925	20 (12)	809
Western Germany	188 (2)	12,479	—	—	417 (1)	3,100	38 (24)	745	—	—	346 (15)	20,234	45 (1)	1,483	856 (46)	37,179
Netherlands	—	—	—	—	30 (2)	560	195 (10)	7,278	—	—	43 (6)	2,728	452 (7)	21,565	100 (27)	3,362
Belgium	—	—	—	—	—	—	218 (9)	3,573	—	—	217 (7)	7,121	87 (2)	5,444	247 (9)	4,967
France	120 (3)	6,597	—	—	50 (2)	2,977	5 (3)	542	—	—	324 (8)	13,105	454 (7)	22,498	225 (4)	10,100
Switzerland	—	—	—	—	—	—	122 (5)	5,025	—	—	37 (4)	3,276	109 (3)	7,625	342 (16)	12,408
Spain	—	—	—	—	—	—	13 (1)	637	798 (7)	51,618	233 (4)	22,178	233 (3)	11,697	12 (1)	500
Italy	1,016 (6)	69,682	—	—	34 (3)	4,399	6 (2)	887	115 (1)	7,951	46 (4)	3,182	56 (2)	2,543	18 (1)	1,072
US America	409 (2)	20,381	—	—	6 (1)	282	38 (2)	1,833	—	—	169 (13)	10,378	52 (2)	3,005	600 (25)	26,181
Miscellaneous	270 (4)	27,083	949 (7)	36,126	430 (6)	23,641	1,414 (100)	31,799	401 (6)	38,419	1,434 (92)	87,075	953 (13)	54,138	1,199 (76)	50,698
Total	2,613 (23)	166,095	2,449 (12)	133,003	2,480 (31)	94,077	5,530 (311)	147,623	1,689 (32)	108,427	5,853 (287)	299,135	6,721 (127)	292,548	9,057 (423)	347,604

Total exports of reconditioned machine tools:—Quantity, No. 199; Weight, 14,662 cwt.; Value, £115,470.
Total exports of imported machine tools:—Quantity, Weight 3,258 cwt.; Value, £47,640.

Imports of New Machine Tools

Country of Origin	Bar and Chucking Automatics		Vertical Boring Machines		Other Boring Machines		Drilling Machines		Gear-cutting Machines		Grinding, Lapping and Honing Machines		Capstan and Turret Lathes		Other Lathes	
	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £
Sweden	—	—	—	—	12 (1)	1,538	39 (6)	898	—	—	1,386 (11)	85,606	—	—	1,018 (6)	42,164
Western Germany	735 (8)	35,438	467 (2)	24,780	1,649 (5)	52,518	124 (10)	8,708	601 (5)	31,855	1,423 (64)	79,990	632 (21)	50,476	2,399 (51)	83,311
France	—	—	34 (2)	8,337	—	—	64 (3)	2,613	—	—	325 (5)	32,564	—	—	555 (8)	27,287
Switzerland	258 (13)	24,171	356 (6)	28,461	—	—	29 (14)	2,496	56	4,751	107 (10)	13,503	523 (17)	44,404	407 (12)	31,463
US America	227 (3)	23,130	90 (2)	4,597	—	—	130 (6)	20,036	2,411 (15)	155,290	2,463 (31)	185,441	842 (4)	70,932	170 (8)	3,896
Miscellaneous	20 (2)	682	—	—	572 (5)	17,057	383 (5)	9,976	—	—	634 (32)	28,730	103 (3)	3,176	569 (78)	28,899
Total	1,240 (26)	83,421	947 (12)	66,175	2,233 (11)	71,113	769 (44)	44,727	3,068 (22)	191,896	6,338 (153)	425,834	2,100 (45)	168,988	5,118 (158)	217,020

Total imports of reconditioned machine tools:—Quantity, No. 61; Weight. 4.208 cwt.; Value, £98,895.

…OOL IMPORTS AND EXPORTS (Classified)

…Tools and Parts during March, 1961

…er …es	Milling Machines		Presses		Sheet-metal Working Machines		Sawing Machines		Screwing and Threading Machines		Planing, Shaping and Slotting Machines		Unit Transfer Machines and Heads		Other Machines		Machine Tool Parts*		Total	
Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt.	Value £	Quantity. Cwt. and No.	Value £
…1,153	125 (4)	6,038	1,742 (14)	35,081	330 (15)	10,243	63 (12)	2,068	11 (2)	714	176 (7)	4,595	—	—	811 (34)	17,242	428	22,841	5,259 (152)	161,334
…9,600	710 (3)	19,262	1,112 (13)	34,771	1,026 (4)	27,064	25 (2)	670	101 (3)	6,922	527 (4)	18,661	—	—	769 (6)	11,387	640	31,583	9,558 (104)	331,992
—	78 (5)	6,367	201 (2)	4,347	—	—	—	—	37 (1)	1,232	—	—	—	—	—	—	87	4,859	992 (18)	37,314
…1,946	1,152 (27)	49,407	3,124 (7)	70,569	724 (4)	15,772	14 (2)	418	59 (4)	1,873	367 (13)	10,933	4 (10)	747	783 (13)	29,116	1,294	61,232	14,743 (298)	519,708
…1,977	87 (2)	1,853	194 (6)	4,063	369 (5)	8,723	31 (6)	791	—	—	70 (4)	5,512	—	—	156 (5)	4,116	58	5,355	2,443 (98)	88,346
…5,522	806 (6)	45,844	196 (2)	1,437	—	—	—	—	—	—	1,029 (2)	20,109	—	—	20 (1)	2,207	4,221	74,990	8,182 (38)	197,470
…0,873	125 (7)	5,708	800 (10)	19,057	170 (13)	2,878	150 (31)	4,932	2 (1)	50	48 (5)	1,243	—	—	45 (10)	1,904	219	16,142	2,612 (173)	86,470
—	—	—	—	—	399 (7)	36,923	14 (2)	1,910	—	—	—	—	—	—	—	—	2	62	791 (17)	79,244
7,357	723 (5)	20,830	—	—	448 (9)	32,207	—	—	21 (1)	1,800	—	—	—	—	54 (3)	1,434	651	30,045	2,896 (72)	128,997
1,900	—	—	—	—	—	—	2 (1)	54	5 (2)	505	—	—	—	—	—	—	12	1,067	122 (8)	4,816
809	—	—	1,260 (4)	29,034	—	—	—	—	—	—	—	—	—	—	488 (1)	13,828	30	3,140	2,048 (23)	55,232
…7,179	351 (4)	17,675	52 (1)	670	92 (2)	7,609	9 (2)	1,768	155 (2)	10,541	2 (6)	140	—	—	717 (12)	27,310	422	16,593	3,690 (118)	157,526
3,362	60 (3)	6,347	130 (2)	5,751	4 (5)	159	—	—	—	—	8 (2)	372	—	—	4 (8)	850	92	9,488	1,118 (72)	58,460
4,967	200 (1)	11,840	7 (1)	355	278 (2)	7,906	—	—	—	—	—	—	—	—	182 (2)	12,051	22	2,529	1,458 (33)	55,786
…0,100	180 (1)	9,162	205 (8)	6,845	—	—	—	—	—	—	40 (1)	1,072	—	—	648 (8)	25,436	82	9,540	2,333 (45)	107,874
…2,408	121 (57)	6,463	200 (1)	6,020	—	—	—	—	—	—	6 (1)	163	—	—	—	—	79	6,055	1,016 (87)	47,035
500	17 (1)	1,055	1,381 (1)	36,119	36 (2)	1,012	—	—	—	—	—	—	—	—	172 (1)	4,840	12	2,452	2,907 (21)	132,108
1,072	120 (1)	8,156	39 (20)	2,000	181 (3)	13,921	—	—	—	—	40 (1)	1,600	—	—	449 (8)	43,292	184	23,624	2,304 (52)	182,309
…6,181	48 (2)	1,792	—	—	14 (6)	370	—	—	133 (4)	10,433	64 (2)	2,139	1 (3)	187	116 (4)	7,812	187	13,071	1,837 (66)	97,864
…0,698	1,199 (28)	63,741	531 (39)	29,048	380 (28)	10,569	53 (6)	1,613	55 (9)	5,419	832 (27)	29,077	—	—	545 (62)	19,612	1,124	42,266	11,769 (503)	550,324
…47,604	6,102 (157)	281,540	11,174 (131)	285,167	4,451 (105)	175,356	361 (64)	14,224	579 (29)	39,489	3,209 (75)	95,616	5 (13)	934	5,959 (178)	222,437	9,846	376,934	78,078 (1,998)	3,080,209

Figures in parentheses denote number of machines. * Not including machine tool cutting parts.

…Tools and Parts during March, 1961

…er …es	Milling Machines		Presses		Sheet-metal Working Machines		Sawing Machines		Screwing and Threading Machines		Planing, Shaping and Slotting Machines		Unit Transfer Machines and Heads		Other Machines		Machine Tool Parts*		Total	
Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt. and No.	Value £	Quantity. Cwt.	Value £	Quantity. Cwt. and No.	Value £
…2,164	304 (8)	13,846	—	—	77 (3)	1,738	—	—	—	—	13 (10)	863	—	—	1 (3)	453	84	5,344	2,934 (48)	152,450
…3,311	598 (16)	56,660	3,112 (27)	74,469	484 (42)	22,729	335 (58)	10,790	561 (22)	29,517	1,646 (10)	63,718	—	—	3,668 (45)	124,906	528	45,565	18,962 (386)	795,430
…7,287	865 (16)	44,795	315 (5)	15,011	242 (12)	5,597	8 (1)	372	—	—	—	—	—	—	726 (19)	23,144	128	9,978	3,262 (71)	169,698
…1,463	564 (11)	27,647	733 (7)	33,309	—	—	—	—	—	—	17 (3)	1,910	—	—	141 (23)	14,105	180	27,237	3,371 (118)	253,457
3,896	1,563 (19)	84,606	1,047 (9)	70,943	353 (25)	15,568	8 (1)	731	165 (29)	16,576	2 (1)	325	322 (1)	48,897	3,677 (36)	96,460	1,673	203,356	15,143 (190)	1,000,784
…8,899	1,349 (36)	36,373	1,681 (34)	24,199	204 (13)	5,174	38 (5)	1,456	94 (1)	4,989	105 (2)	8,933	—	—	79 (11)	6,894	335	23,064	6,166 (222)	199,602
…217,020	5,243 (106)	263,927	6,888 (82)	217,931	1,360 (95)	50,806	389 (65)	13,349	820 (52)	51,082	1,783 (26)	75,749	322 (1)	48,897	8,292 (137)	265,962	2,928	314,544	49,838 (1,035)	2,571,421

Figures in parentheses denote number of machines. * Not including machine tool cutting parts.

PRICES OF MATERIALS

All prices per ton except where otherwise stated.

Pig Iron*

Foundry and Forge No. 3, Class 2

Middlesbrough (10 tons or over)	£21 17 0
Birmingham (10 tons or over)	£21 9 3

Phos. Over 0·1 up to 0·4%

Birmingham (6 ton lots)	£23 5 0
Grangemouth (6 ton lots)	£23 10 0

Hæmatite

English No. 1 (10 tons or over)

N.E. Coast (made in N.E.)	£23 19 0
Scotland (made in Scotland, zone S.I.)	£24 5 6
Sheffield	£25 9 0
Birmingham	£25 13 0

Welsh 10 tons or over	£23 19 0

Steel Products*

Medium plates (50 tons and over)	£43 16 6
Mild steel plates, ordinary (50 tons and over)	£40 7 0
Boiler plates (50 tons and over)	£42 17 0
Flat bars, 5 in. wide and under (50 tons or over)	£39 1 0
Round bars, under 3 in. (50 tons or over)	£39 1 0
Billets, rolling quality, soft U.T. (100 tons or over)	£31 15 6

Phosphor Bronze

Ingots (2B8) (A.I.D.) d/d	£315 0 0

Copper

Cash (mean)	£230 7 6
Cold rolled and hot rolled sheets 4 ft. by 2 ft. by 10 SWG	£306 10 0—£306 15 0
Rods, 3/16 in. to 3/4 in. diam.	£321 10 0
Tubes, 1½ in. bore by 10 SWG, ton lots, per lb.	3s. 1½d.
Wire rod, black, hot-rolled (1/4-5/16 in.), English	£245 17 6

Zinc

Refined, minimum 98 per cent purity, current month (mean)	£76 18 9

Brass

Tubes, solid drawn, basis per lb.	1s. 9¾d.
Strip 63/37, 6in. by 10 SWG coils, ton lots	£256 10 0—£259 10 0
Rods, ¼-3 in. diam. (59 per cent copper)	2s. 0¾d.

Yellow Metal

Condenser plates, per ton	£186 0 0
Rods, per lb.	2s. 1½d.

Aluminium

Ingots, min. 99·5 per cent Canadian d/d	£186 0 0

Tinplates

**U.K. Home trade:

Cold reduced, f.o.r. makers works (15-50 tons)	£3 6 8

U.K. Export:

Hot rolled basis, f.o.r. works port	73s. 6d.—76s. 0d.
Cold reduced basis, f.o.r. works port	73s. 6d.—76s. 0d.

Gunmetal

Ingots, B.S. 1400 L.G.2, delivered	£219 0 0

*Subject to increase of 1%.

**Official maximum price, after allowing for adjustments for increase in price of tin.

MAKERS' PRICES

Hexagon Steel Bars[1]

Sizes in inches from 1 in. up to 2·21 and 2·41 a/f ex works, 2 tons basis	£42 17 6†
Free cutting black	£46 14 6†

Reeled Steel Bars[1]

Single-reeled, 1½ in. upwards, f.o.t. works (+ usual extra for sizes)	£43 9 0†
Free cutting	£47 7 0†

Precision-ground Mild Steel[2]

1-in. diam. ± 0·00025-in. 4-ton lots, per cwt.	124s. 6d.†

Bright Ground Stainless Steel Bars[3]

EN56AM (martensitic, free cutting)	£304 10 0
EN58AM (austenitic free cutting)	£377 10 0

Prices are basic, subject to extras.

High-speed Steel

Black random length bar. All prices basic, per lb., subject to extras:

Molybdenum "66"	6s. 5d.
Molybdenum "46"	6s. 3d.
14 per cent tungsten	6s. 11d.
16 per cent tungsten	7s. 4d.
18 per cent tungsten	7s. 9d.
22 per cent tungsten	9s. 2d.
5 per cent cobalt	10s. 10d.
4·75/5·25 molybdenum + 6·0/6·75 tungsten + 1·75/2·05 vanadium per cent (5-6-2)	6s. 7d.

Precision-ground, High-speed Free-turning Brass Rod[2]

⅜-in. diam. ±0·00025-in., 2 ton lots, per lb.	2s. 7⅜d.

Grey Iron Rod

Die Cast[4] in random lengths 18 in. to 26 in. rough machined 1/16-in. above listed size. Extra for definite lengths. Discounts for orders over £150.

	Per cwt. net. Mark I	Mark III
½ or ⅝ in.	260s. 3d.	338s. 3d.
¾ or 1⅛in.	208s. 4d.	267s. 3d.
1¼ to 1½ in.	146s. 3d.	181s. 7d.
1⅝ to 2 in.	112s. 7d.	133s. 6d.
2¼ to 3¼ in.	97s. 1d.	112s. 9d.
3½ to 12 in.	91s. 9d.	105s. 3d.

Continuous Cast

10-ft. lengths, centreless machined 1 to 3-in. diam. + 0·010 to 0·020 in., prices as quoted for die cast bar[4]

centreless ground +0·010 in. Extra	1 or 1⅛ in.	208s. 4d.
for hardenable	1¼ to 1½ in.	146s. 3d.
alloy iron[5]	1⅝in. to 2 in.	112s. 7d.
Per cwt. net	2¼ to 3¼ in.	97s. 1d.

Stellite[6]

Welding Rods, plain

¼ in. diam., per lb.	30s. 0d.

Toolbits

¼ in. sq. × in., each	22s. 3d.

[1] Colvilles, Ltd., Glasgow, and 17 Grosvenor Street, London, W.1. [2] Pratt, Levick & Co., Ltd., Chester. [3] Spartan Steel & Alloys, Ltd., St. Stephens Street, Birmingham, 6. [4] Sheepbridge Alloy Castings, Ltd., Sutton-in-Ashfield. [5] "Flocast," Harold Andrews Sheepbridge, Ltd., Halesowen. [6] Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull.

† Plus 1 per cent.

BASIC PRICES FROM LONDON STOCK[6]

Free Cutting Steel

Bright cold drawn:

(Ussaspeed) over 1 to 2 in.	£59 4 6‡
Lead bearing (Ussaled)	£63 11 0‡
Precision ground, 1½ in.	£84 14 6‡

Bright Drawn

M.S. bars (M.M.C.) over 1½ to 2 in.	£56 10 0‡
Square edge flats (Ussflat)	£73 6 6‡
M.S. angles (Ussaspead)	£100 6 6‡
Case hardening (EN) (Ussacase over 1½ to 2 in.	£62 10 0‡
M.S. bars (EN3B) (Ussamild) over 1½ to 2 in.	£58 16 6‡
Carbon manganese semi-free cutting case hardening (EN202) (Ussaspead 202) over 1½ to 2 in.	£71 5 0‡
35/45 ton tensile (EN6) (Usen) over 1 to 1½ in.	£67 3 0‡
0·4 carbon normalized (Ussaspead "40") over 1½ to 2 in.	£69 5 0‡
0·45 carbon normalized EN9 (Ussaspead 55)	£69 15 0‡
Carbon manganese steel to Specification EN16T (Ussaspead 5565), per ton	£126 17 0‡

Ground Flat Stock

18-, 24-, and 36-in. lengths (Ussaspeed). List prices plus 10 per cent, less 5 per cent.

Oil Hardening Cast Steel

Non-shrink (Ussaspead N.S.O.H.), ⅛ in. to 2½ in., per lb.	1s. 11d.
Non-distorting heavy duty (Ussaspead H.C.H.C.), ⅛ in. to 2½ in., per lb.	4s. 2d

Silver Steel

(0·194-in. to 1½-in.)

Genuine Stubs quality, per lb.	4s. 10d. less 27½%
M.M.C. quality, per lb.	2s. 8d. + 6½%
Boxes of 16 assorted sizes, 1/16 in. to ⅜ in. diam.	7s. 6d.

Stainless Steel

KE40AM (free cutting), per lb.	3s. 8d

Glacier Machined Bronze Bars

Phosphor bronze (2B8), Lead bronze	Prices on application

High-speed Steel

18 per cent tungsten. Prices on application

Toolholder bits:

Ussaspead "Super", " "Supreme", Cobalt 10	List price

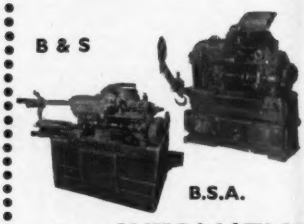
Shimstock

Steel assorted, per tin	3s. 6d.
Brass " "	7s. 3d.

[6] Macready's Metal Co., Ltd., Pentonville Road, N.1. Subject to confirmation by London Office. Delivered free by van in London area.

‡ Plus 1 per cent.

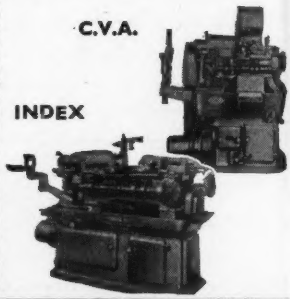
MELBOURNE



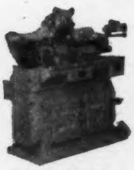
THE SPECIALISTS IN THE REBUILDING OF TURRET TYPE AUTOMATICS

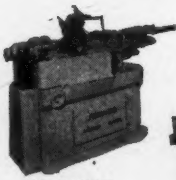
Can now offer

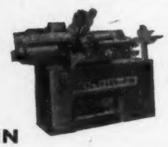
THE SAME UNSURPASSED RE-BUILDING SERVICE
FOR SWISS-TYPE AUTOMATICS



- Machines are rebuilt to original specification of accuracy and limits.
- All parts fitted are interchangeable with maker's spares.
- Reconditioning not only costs less than a new machine but can also be charged wholly as a maintenance expense ranking for full tax relief.
- We can loan a machine equivalent to the one taken out thereby assuring customer of his continuity of production.


BECHLER


TORNOS


PETERMANN

★ May we visit your works and quote for reconditioning your machine?

MELBOURNE ENGINEERING CO. LTD., MELBOURNE, Near DERBY
(H. E. SLAWSON, M.B.E., M.I.P.E., Man. Director) Tel.: MELBOURNE 232.

STEEL PARALLELS

for superlative accuracy at reasonable price

CROWN WORKS

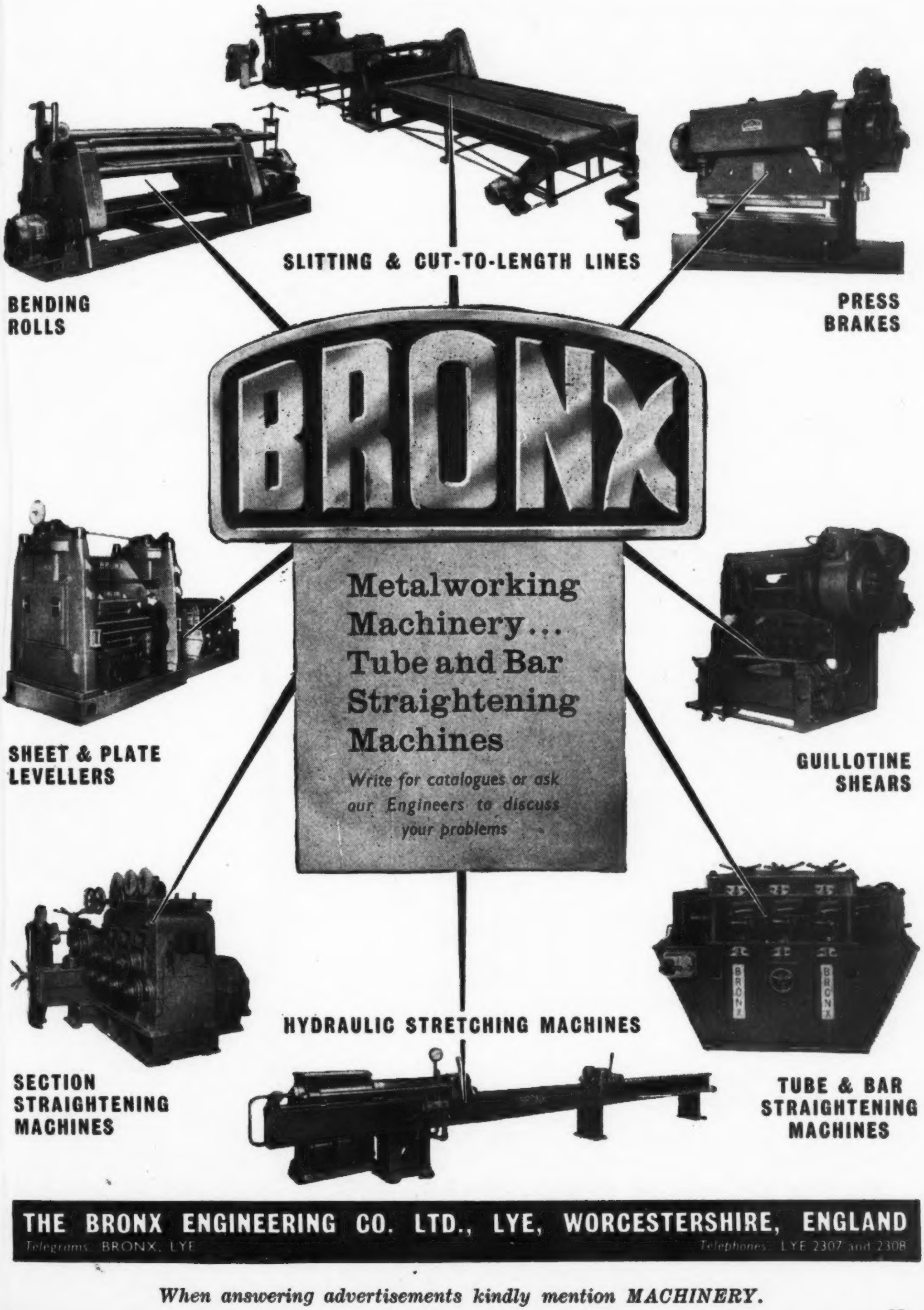
GRADE 'A'	RANGE OF SIZE
HARDENED, GROUND & LAPPED TO B.S.S. No. 906 FOR STRAIGHTNESS, PARALLELISM, SIZE AND SQUARENESS. E.G. 12in. by 3in. by 1½ in. ± 0.0002in.	4in. by ¾in. by ½in. 6in. by 1in. by ½in. 6in. by ⅞in. by ¾in. 8in. by ¾in. by 1½in. 9in. by 1in. by ¾in.
GRADE 'B'	
HARDENED & GROUND TO B.S.S. No. 906. E.G. 12in. by 3in. by 1½in. ± 0.0004in.	10in. by 2in. by 1in. 12in. by 2in. by 1¼in. 12in. by 3in. by 1½in.

COMPLETE IN WOODEN CASES.

The above and numerous other sizes available for immediate delivery. Send your enquiries to:—

WINDLEY BROS. LTD. CROWN WORKS · LONDON ROAD CHELMSFORD · ENGLAND

TELEPHONE: CHELMSFORD 2224

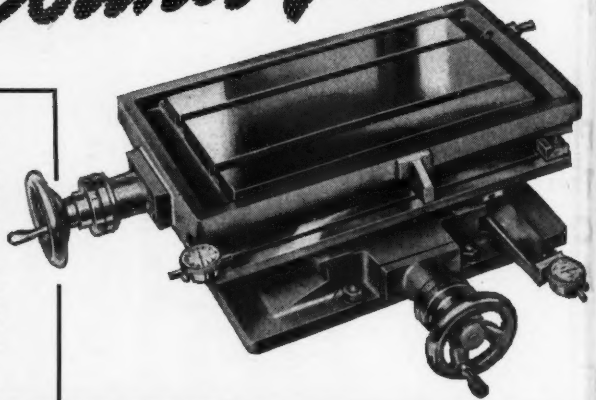

SLITTING & CUT-TO-LENGTH LINES
BENDING ROLLS
PRESS BRAKES
BRONX
Metalworking Machinery... Tube and Bar Straightening Machines
Write for catalogues or ask our Engineers to discuss your problems
SHEET & PLATE LEVELLERS
GUILLOTINE SHEARS
HYDRAULIC STRETCHING MACHINES
SECTION STRAIGHTENING MACHINES
TUBE & BAR STRAIGHTENING MACHINES
THE BRONX ENGINEERING CO. LTD., LYE, WORCESTERSHIRE, ENGLAND
Telegrams: BRONX, LYE
Telephones: LYE 2307 and 2308

GRIMSTON

Compound Tables

The GRIMSTON No. I Compound Table, with its graduated micrometer hand-wheels and dial indicators, transforms the commonplace column or bench drilling machine into a machine tool capable of accurate jig drilling, etc. The model illustrated has a working area of 18" x 10", with a longitudinal travel of 13" and transverse movement of 6". The outstanding features of this table are its accuracy, its low over-all height of only $5\frac{3}{8}$", and its reasonable cost. A larger No. 2 Table, movements 20" x 12" is also available.

Ask for details quoting Ref. M16.



GRIMSTON ELECTRIC TOOLS LTD. PROGRESS WAY, CROYDON, SURREY.

PHONE: CROYDON 0131 GRAMS: GRIMTOOL, CROYDON

---

20 FORGINGS per minute!

ETCHELLS

VERTICAL FORGING MACHINES

FOR SPEED, ACCURACY & RELIABILITY

DAVID ETCHELLS (MACHINERY) LTD.

STAFFORD ROAD · DARLASTON · SOUTH STAFFORDSHIRE

Telephone: JAMESBRIDGE 2461 (6 lines)

ONE MACHINE TO DO THE WORK OF TWO !

PITTLER

FRONT-LOADING TWIN-SPINDLE CHUCKING AUTOMATIC

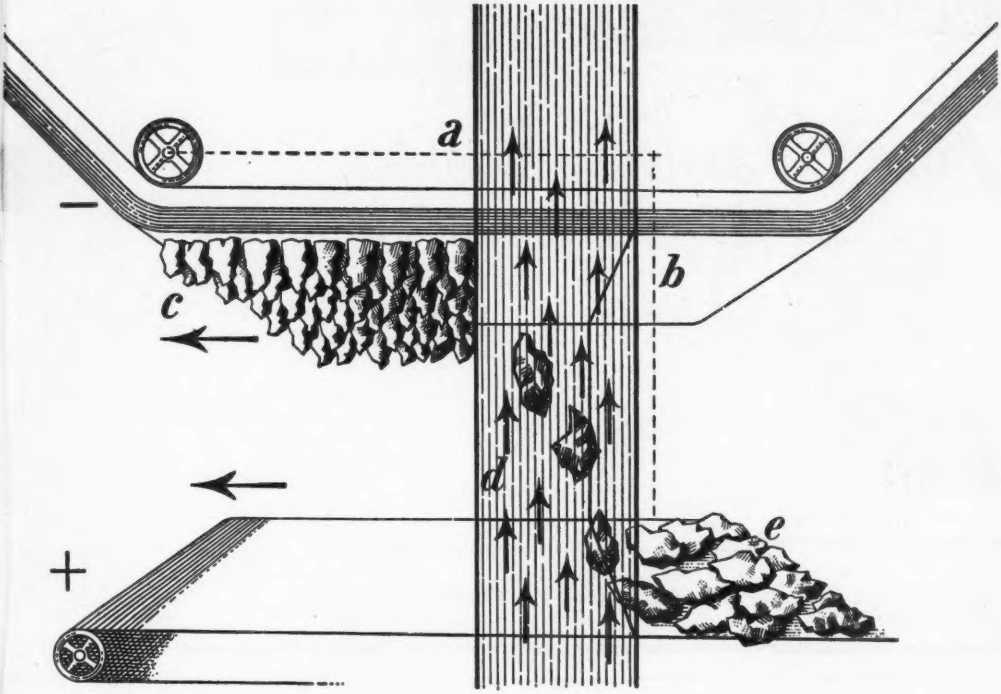
BRUSSELS MACHINE TOOL SHOW
September 3rd — 12th
STAND 4113 HALL 4

Hydraulic chucking. Turns up to 9" diameter. A fast, powerful and accurate tool to machine both sides of a component simultaneously.

No cams to set. Feeds limited by positive stops. Spindle speeds and feeds set by dial. Hydraulic copying on three slides (optional).

Full details from :

B·P·S MACHINERY & SPARES CO. LTD.
245 KNIGHTSBRIDGE · LONDON S.W.7. Telephone : KENSINGTON 9887


a
b
c
d
e
−
+

but we're not so sure ourselves. We know our Drillmax Equipment is good and if you know it is good also—what's it matter what our artist thinks?

Drillmax Automatic Equipment includes a unique range of Standardised Units—Screw Feed, Cam and Hydraulic Unit Heads, Multi-drill Heads and Standard Drill Spindles and Gearing—Automatic Rotary Indexing Tables, Wing Bases, Columns, Loading and Unloading Mechanisms, etc., from which complete Automatic Rotary, Drum and In-line Transfer Special Purpose Machines can be built.

We invite you to visit our Aldridge Works.

Brasshouse DRILLMAX

Peter Brasshouse Ltd., Drillmax Division, Leighswood Works, Leighswood Rd., Aldridge, Staffs. Tel.: ALDridge 52814-5

Looking in the right direction

Ratcliffe SPRINGS

F. S. RATCLIFFE (ROCHDALE) **LTD.**, Crawford Spring Works, Norman Rd., Rochdale
'Phone : Rochdale 40415.
'Grams : "Recoil" Rochdale. Telex : 63178

CW. 5968

For precision at low cost THE MARK III

B.C.A. JIG BORING MACHINE

INCORPORATING MANY NEW FEATURES

Ideal for your Toolroom small production runs

BRIEF SPECIFICATION: Boring up to $1\frac{1}{2}''$ dia. Table 8" dia.
11 Speeds. 300 to 3,250 r.p.m. Lead screws hardened & Ground

PRICE £352 BASIC MACHINE EX-WORKS Including
Two-speed Motor, Cabinet extra.

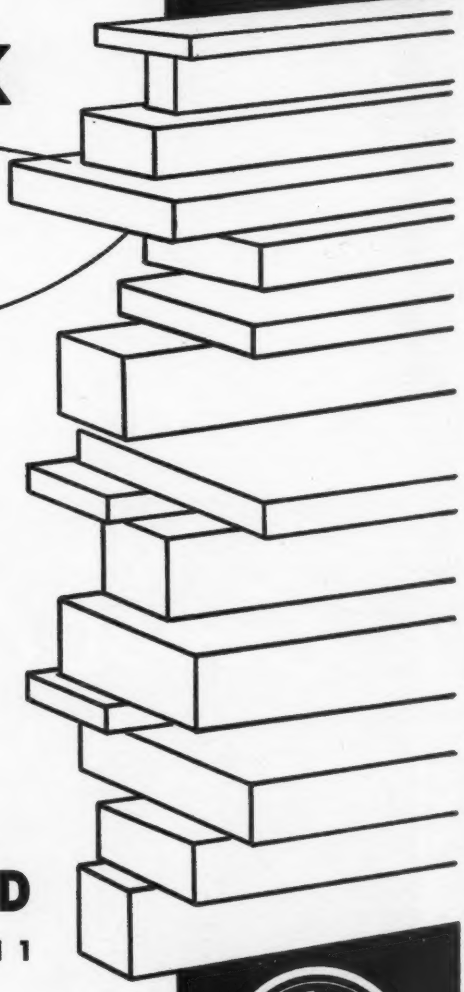
Send for descriptive leaflet and attachment details

We shall be pleased to arrange a demonstration at your works

QUICK DELIVERY

R. E. GODFREY LTD. ***Engineers, Machinery & Equipment Div.***
REDHILL AERODROME : REDHILL : SURREY
Tel: NUTFIELD RIDGE 3339 & 3227

CARBON CHROME ALLOY STEEL
GROUND FLAT STOCK



Guaranteed to $\pm 0{\cdot}001$ in thickness

Indispensable in the manufacture of jigs, templates, gauges, press tools, etc., oil hardening, non-distorting steel in standard 18in. lengths. Each piece separately packed with full heat treatment instructions. Standard 18in. lengths also non-standard sizes 12in., 24in. and 36in. lengths Widths from 3/16in., to 12in., thicknesses from 1/32in. to 2in.
We hold large stocks of non-standard sizes and Round Stock $\frac{1}{8}$in. to $2\frac{3}{4}$in. dia.

30,000 LENGTHS ALWAYS IN STOCK

Write for specifications and prices

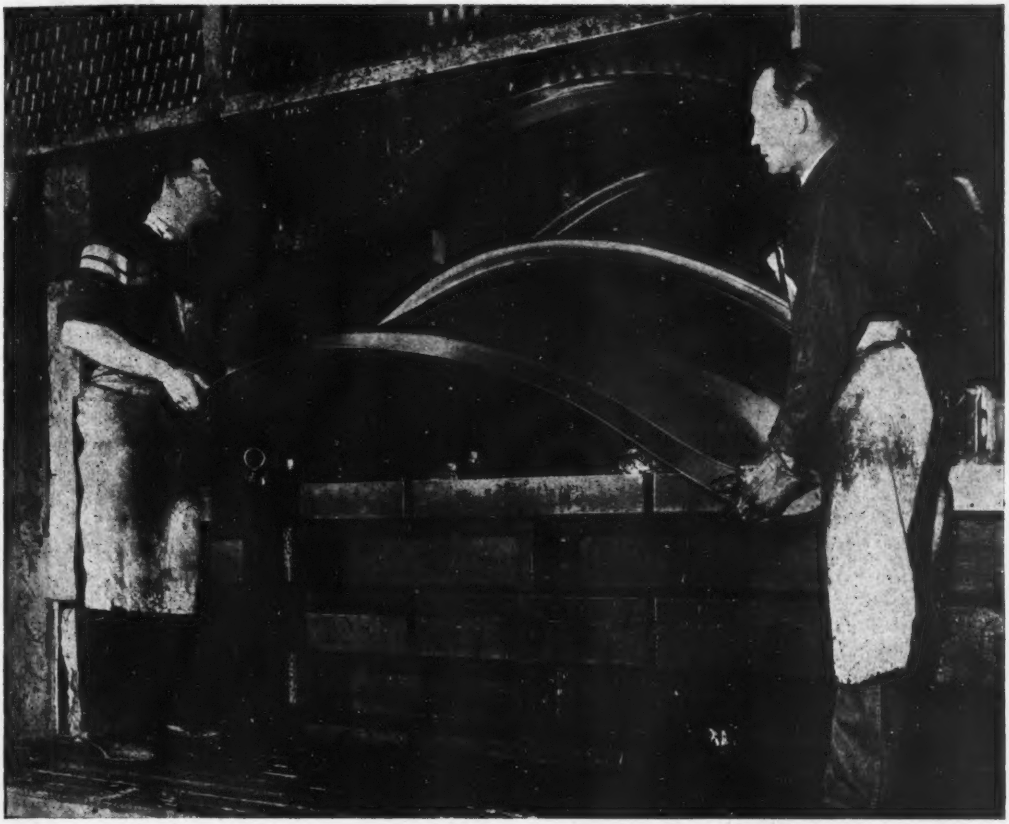
MAIN STOCKHOLDERS & DISTRIBUTORS

T. NORTON & CO. LTD

CARVER STREET BIRMINGHAM 1

Telephone: Central 4325 (5 lines)

TN&Co LTD



Photograph by courtesy of Messrs. A. V. Roe & Co. Ltd.

In the short run, too

It is not only in the long run that Araldite proves so economical. For short runs, calling for tools which can be made quickly and cheaply, Araldite epoxy resins offer many advantages. These include: high strength and dimensional stability; resistance to wear and freedom from deterioration; excellent adhesion to many materials, facilitating bonding and the use of fillers or metal inserts; ease of manufacture from moulds of many materials; ease of modification in the event of change of design; suitability for making tools of any size. For the past ten years, Messrs. A. V. Roe & Co. Ltd. have used Araldite to manufacture large press tools for aircraft production. The photograph shows a freight door-frame measuring 84" by 60" by 4" for the new Avro 748. It is formed in 14 s.w.g. light alloy by an Araldite-faced double action draw tool, which has already produced over 100 pressings.

May we send you our booklet 'Araldite Resins for Tooling'?

Araldite epoxy resins are used
for producing patterns, models, jigs and tools.

for casting high grade electrical insulation.

for impregnating, potting and sealing electrical windings and components.

for producing glass fibre laminates.

as fillers for sheet metal work.

as protective coatings for metal, wood and ceramic surfaces.

for bonding metals, ceramics, etc.

Araldite EPOXY RESINS

Araldite is a registered trade mark

CIBA (A.R.L.) LIMITED, DUXFORD, CAMBRIDGE. TELEPHONE: SAWSTON 2121

AP 645

You Will Get—

Several Times More Blanks Per Re-Grind!

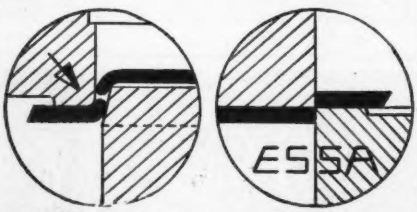
Plus—

ONLY HALF GRIND-OFF ALLOWANCE FROM DIE SURFACE

equals—

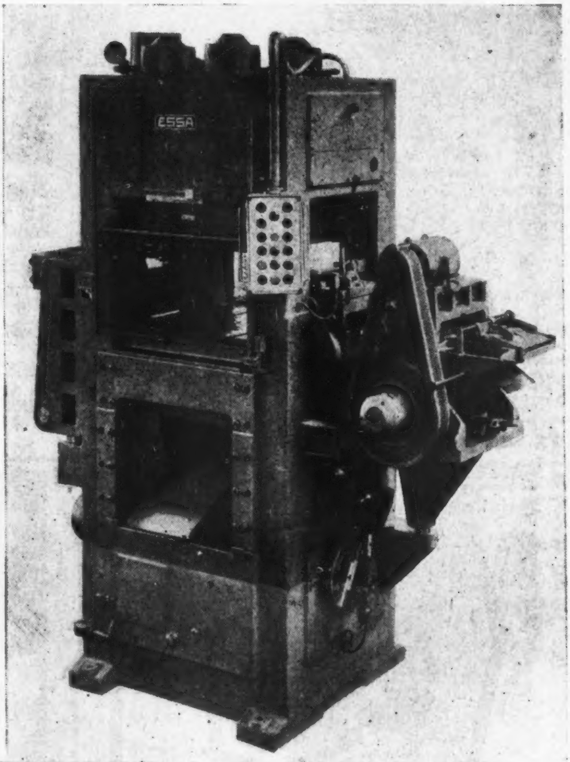
MANY TIMES LONGER TOOL LIFE

The above claim has been confirmed by a large number of tests and by experience of our customers.



FORMERLY: Ordinary Press —tool breakage. **NEW: B.H.A. PRESS No penetration.**

The upwards movement of the ram automatically eliminates vertical backlash: the cause of punch into die penetration.
This feature is especially important when tungsten carbide tools are used.



ESSA

AUTOMATIC PRESSES

MODELS BHA 30, 60, 120, 180t.

See these machines in operation at the
EUROPEAN MACHINE TOOL EXHIBITION BRUSSELS, SEPTEMBER 3—12, 1961

MEANWHILE FULL DETAILS GLADLY SENT ON REQUEST OR A DEMONSTRATION READILY ARRANGED.

VAUGHAN
ASSOCIATES LIMITED
VAUGHAN HOUSE, 4 QUEEN ST., CURZON ST., LONDON, W.1
Telephone: GROSVENOR 8362-5
Midland Office: WILFORD CRESCENT, NOTTINGHAM Tel. 88008

NECO D.C. ELECTRIC MOTORS CUT COSTS

✻ geared or ungeared from $\frac{1}{8}$ to 2 h.p. ✻ special battery vehicle motors from ·33 to 3 h.p. ✻ 100 to 250 volts—special voltages quoted for ✻ ungeared, up to 15,000 r.p.m.—geared, down to exceptionally low speeds (e.g. type SW down to 0·055 r.p.m.) ✻ compound, shunt or series windings ✻ enclosures—drip proof, totally enclosed or T.E.F.C. ✻ competitive prices ✻ *Quick delivery—specials at minimum cost with little delay*

NECO

NORMAND ELECTRICAL CO. LTD.
NORTH STREET, CLAPHAM COMMON, LONDON, S.W.4
Telephones: MACaulay 3211 (5 lines) *Telegrams: Necondit, Clapcom, London*

NECO GEARED MOTORS LTD.
204 QUEENSTOWN ROAD, LONDON, S.W.8

Gordon Try Ltd

MACHINE TOOL STOCKIST

NEW MACHINES

ACORN HI-LO CAPSTAN.
COLCHESTER MASCOT LATHE.
COLCHESTER TRIUMPH LATHE.
WILLSON MARK V LATHE.
WILLSON MARK I LATHE.
MYFORD SUPER 7 LATHE.
DENBIGH D4 MILL.
CENTEC 2B UNIVERSAL MILL.
BEAVER TURRET MILL.
ELLIOTT TV2 TURRET MILL.
BURDETT SURFACE GRINDER.
ABWOOD CARBIDE T & G GRINDER.
EAGLE SURFACE GRINDER.
MILFORD TOOL GRINDERS.
Q & S 6in. AND 8in. HACKSAWS.
WICKSTEAD 12in. HACKSAW.
FORTE HORIZONTAL BANDSAW.
DENBIGH FLY PRESSES.
PROGRESS DRILLING MACHINES.
INVICTA 4M SHAPER.

REBUILT AND USED MACHINE TOOLS

GISHOLT No. 3 CAPSTAN LATHE.
WARD 2A CAPSTAN LATHE.
HERBERT 2SS CAPSTAN LATHE.
SOUTHWARK No. 2 CAPSTAN.
HERBERT 9 COMB. TURRET.
A.T.W. 12in. by 120in. LATHE.
BERRY 9½in. by 48in. LATHE.
SOUTHBEND 6½in. by 36in. LATHE.
NEWELL 10in. by 24in. UNI. GRINDER.
LANDIS 10in. by 30in. UNI. GRINDER.
ARTER 12in. RING GRINDER.
B & S No. 13 UNI. GRINDER.
J & S TOOL & CUTTER GRINDER.
HUNT DRILL GRINDERS.
MATRIX THREAD GRINDERS.
CINCINNATI No. 2 VERT. MILL.
MILWAUKEE 2K UNIVERSAL.
CINCINNATI 1/12 AUTO MILL.
ASQUITH PROFILE MILL.
HERBERT 18V VERT. MILL.

● *Send for lists of new and rebuilt machines*

Member of the B.A.M.T.M.

THE CAUSEWAY
EGHAM · SURREY
TELEPHONE : EGHAM 4166

BUCK & RYAN LTD

ESTABLISHED 1824

ENGINEERS' TOOLS

LARGE STOCKS OF

FINE TOOLS
Micrometers Height Gauges Verniers Etc.

CUTTING TOOLS
Milling Cutters Taps Dies Reamers Etc.

LIGHT MACHINE TOOLS
Lathes Millers Drillers Etc.

HAND TOOLS
A VERY LARGE SELECTION

DEPT. 5
310 312, EUSTON ROAD, LONDON, NW1
AND AT 261, EDGWARE ROAD, W2
Telephone: EUSton 4661

FOR HARD STRONG THREADS IN SOFT MATERIALS

you Can't beat

CROSS

THE BRITISH

WIRE THREAD INSERTS

★ HARD THREADS IN SOFT MATERIALS

★ NEW THREADS IN DAMAGED COMPONENTS

FULL RANGE OF SIZES AND THREAD STANDARDS IMMEDIATELY FROM STOCK

CROSS MANUFACTURING CO. (1938) LTD.

BATH, SOMERSET. Tel.: COMBE DOWN 2355. Grams: CIRCLE, BATH

Specialists in the manufacture of Jet Engine Labyrinths, Circlips, Spring Washers, Springs, etc.

★ ALWAYS CONTACT

Brown Brothers (METALS) Ltd

(A MEMBER OF THE BROWN BROTHERS LTD GROUP OF COMPANIES)

FOR MILLS

Ledloy

STEEL STOCKHOLDER SERVICE

DOWNS ROAD, LONDON, E.5

Telephone : CLIssold 2561

DAVID

Dowling

BENCH ENGRAVING MACHINES

FOR 2 AND 3 DIMENSIONAL WORK

For full details write:

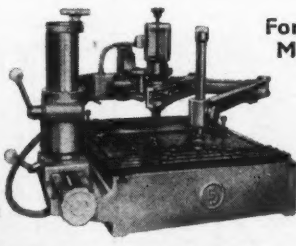
DAVID DOWLING LTD

BATES RD · HAROLD WOOD

ROMFORD · ESSEX

TELEPHONE

INGREBOURNE 43904/5

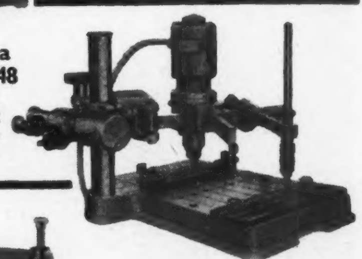


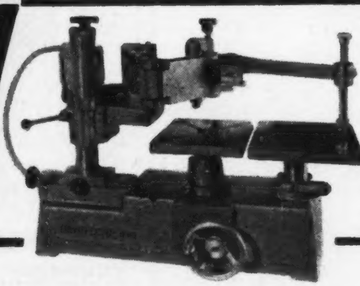
For fast easy operation

MODEL 713 Gives reductions from 2:1 to 8:1. Easy operation enables engraving to be carried out nearly as fast as ordinary writing. Exceptionally sensitive balanced pantograph, giving automatic withdrawal of cutter and tracer.

A first class machine at a really low price MODEL 848

Reduction range 2:1 to 4:1. Vertical adjustment to suit workpiece height. Coverage from 5in. × 3in. to 2½in. to 1¼in.





For 3D work

MODEL 242

Compact - Sturdy - Large capacity - for fine engraving, mould and die work. Pantograph range from 2:1 to 8:1

Palamit units are for use where the advantages of **MEKELITE** units have to be sacrificed to the consideration of low first cost. The difference in price is due to the simplified design and not to lower standards of material and workmanship.
Various arm lengths (max. horizontal reach 39in.). Five sizes of reflector. Seven types of base. *Full particulars on request.*

MEK-ELEK Eng. Ltd., Western Rd, Mitcham, Surrey
Phone: MITcham 3072 Cables: Mekelek London

Model SSF 950

Mössner

BAND SAWING & BAND FILING MACHINE

Table 30in. × 32in. Throat depth 37in. Maximum height of material admitted 16in. Cutting speeds, infinitely variable, 50-3,000ft. per min. with high speed range of 7,700ft. for fusion cutting.

EARLY DELIVERY

ELGAR MACHINE TOOL COMPANY LIMITED

172-178 VICTORIA ROAD · ACTON · LONDON W.3 · Tel: ACORN 5555
Midlands Showroom: 1075 Kingsbury Road, Birmingham, 24
Tel: Castle Bromwich 3781/2

NRP 2613C

VULCASCOT

LEVEL-MOUNTS

... INCORPORATING VULCASCOT ANTI-VIBRATION RUBBER PADS MAKE MACHINES MOBILE.

Golden Jubilee 1961

- Reduce Vibration and Wear
- Simplify Machine Installations
- Precision Levelling without Shims
- No Drilling of Floors
- Less Noise, Less Nervous Strain

*Write or phone for literature to:

VULCASCOT (GT BRITAIN) LTD.
87-89 ABBEY RD. LONDON N.W.8.

TOOLING SERVICE

★

Designers & Manufacturers of
JIGS · FIXTURES
PRESS TOOLS
GAUGES · MOULDS
and
SPECIAL PURPOSE MACHINES

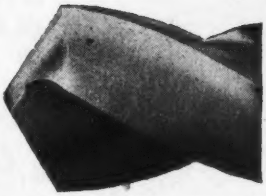
★

RATCLIFFE TOOL Co. Ltd

GORST ROAD, LONDON, N.W.10.
Telephone : ELGar 6693
and at
COED COCH ROAD, OLD COLWYN, N. WALES
Telephone: COLWYN BAY 55288

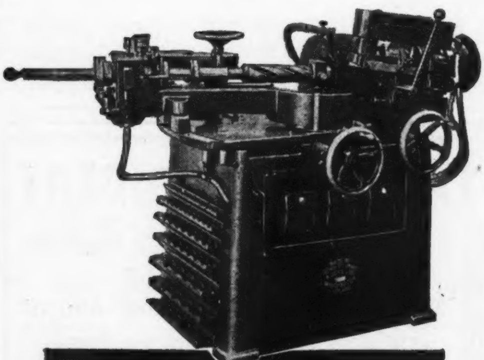
A.I.D. Approved A.R.B. Approved

Prolong drill life . . . maintain high cutting performance



You really must find a place in your tool-room or machine shop for a Hunt Drill Point Grinder. It will ensure better drill point sharpening and point thinning, longer drill life, more accurate holes and faster rates of penetration in whatever metal you handle.

Ask for details of our range which includes medium and heavy duty models.



HUNT
MACHINE TOOLS

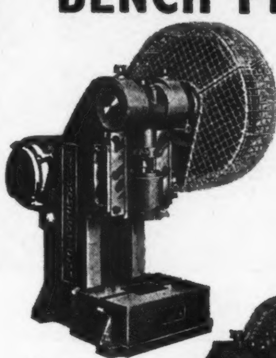
TWIST DRILL POINT GRINDING MACHINE

HERBERT HUNT & SONS LIMITED
MACHINE TOOLS

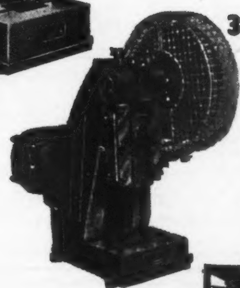
Elsinore Road, Old Trafford, Manchester 16, England

Tel: Trafford Park 0663
Grams: Hunting Manchester 16

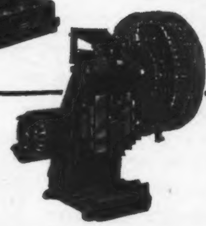
WORCESTER
BENCH PRESSES



6 TON



3 TON



2 TON

Specifications

CAPACITY	6 TON	3 TON	2 TON
Overall Dimensions:	35"Hx15"Wx25"	28"Hx12"Wx24"	22"Hx10"Wx21"
Fixed stroke:	1¼", ¾" or ½"	1" or ½"	⅜" or ⅛"
Ram adjustment:	1¼"	1"	⅜"
Open tool height:	8"	6"	4⅜"
Throat:	4½"	3½"	2⅜"
Bed size:	12"Wx8½"	9"Wx6½"	7"Wx5⅜"

Optional extras: Single stroking clutch mechanism. Floor stands. Crankshaft extension for auto-feed drive.

OFFER We will gladly advise you upon the suitability of Worcester Presses for your job upon receipt of full particulars with, if possible, samples of the work to be done.

Send for free illustrated price lists

JONES & ATTWOOD LTD.
Dept. W.I
STOURBRIDGE WORCESTERSHIRE

Telegrams: HEAT, Stourbridge Telephones: Stourbridge 5106-7-8

CLASSIFIED ADVERTISEMENTS

RATES: LINE (All type, except Situations Wanted), col. width 1¾ in., 13 lines per inch., min. 4 lines, 1 line averages 6 words, 2/6 per line single insertion (series discounts on request). "SITUATIONS WANTED," 1/11 per line, min. 4 lines.

DISPLAY (with or without blocks), £2 6s. 0d. per inch single column and pro rata (series discounts on request).

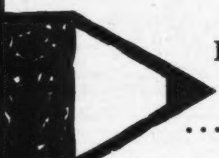
BOX Nos. 2/- extra. Classified advertisements can be accepted at London Office up to Wednesday preceding following Wednesday's issue.

CONTRACT WORK

••• DESIGNS •••

NOW!! SPARK EROSION TO THE TRADE
On Precision Swiss Eleroda Machine
Reduce Press Tool costs
CARBIDE—FORGING—EXTRUSION
IMPACT EXTRUSION DIES
We also modify existing tools

PRESS TOOLS
LAMINATIONS—COMBINATION—PROGRESSION, ETC.
JIGS—FIXTURES PROTOTYPE MACHINING
Designing—Short Order Work—Sub Assemblies Completely Tooled
JIG BORING AND PRECISION GRINDING
LANDEN (ENGINEERS) LTD.
1a, Aubert Park, Highbury, London, N.5
Phone: CANonbury 1075



WE'RE DESIGNING MEN ... with designs on your business

From our drawing boards come designs and draughts for all kinds of fixtures, special purpose machinery, jigs, progression dies, multi-slide tooling ... What puts us in front is the 21 years practical experience behind us. Why not contact us for advice? No job's too enormous or too teeny weeny.

surbiton designs
production tool designers
86 MAPLE ROAD · SURBITON
SURREY · ELMbridge 1135-6-7

PRECISION PRODUCTS (ROMFORD) LTD.
TOOL DESIGNERS AND MANUFACTURERS
For all your needs IN
JIGS · FIXTURES · GAUGES
PRESS TOOLS · FORM TOOLS
AND SPECIAL MACHINES
A.I.D. Approved
Viking Works, London Rd., Romford, Essex. Tel: Romford 61991/2

DESIGN & MANUFACTURE
JIGS, FIXTURES, GAUGES, PRESS TOOLS, HEAVY DIES, MULTI-HEADS, SPECIAL M/C'S
ALAN KEIR LTD.
NORTH ACTON ROAD, LONDON, N.W.10 ELG. 2612

TENNENT ENGINEERING CO. LIMITED
offer a service in design and manufacture of
PRESS TOOLS, JIGS, FIXTURES & SPECIAL PURPOSE MACHINERY
Crown Point Works, Manchester Road, Denton, Nr. Manchester
DENTON 3958

Research — Developments — Precision Engineering capacity available.—G. B. WHALES, LTD., Rear of 123, Old Dover Road, London, S.E.3. Tel.: Greenwich 6625.

Press Tools, Press Work, Capstan Turning and General Machining. Components manufactured and assembled to specifications.—L. PERSON & SON, 68, Shaftesbury Street, London, N.1. CLE. 7139.

Design and Detailing Service; mechanical, jig and tool. Moderate terms.—UNIVERSAL DESIGN SERVICE, 69, Ballytore Road, Rathfarnham Park, Dublin. Ireland.

● *ENGINEERING BUYERS NEED MACHINERY'S ANNUAL BUYERS' GUIDE*

Classified Advertisements (*CONTRACT WORK, contd.*)

Classified Advertisements (*CONTRACT WORK, contd.*)

METAL MACHINISTS LTD.

MANUFACTURERS of SPECIAL PURPOSE MACHINERY, AIRCRAFT COMPONENTS, INSTRUMENTS, ASSEMBLIES, PROTOTYPES. ***Pantographing Surface & Cylindrical Grinding Horizontal Vertical Milling, Capstan Turning, Fitting, Drilling, Thread Milling.***

Tel: BELGRAVIA 2181

Grams: Mametal. Knights. London.

35 Headfort Place, Halkin St., London, S.W.1.

A.I.D. A.R.B. I.ARM. I.F.V.M.E. E.I.D.

SMALL WELL EQUIPPED FACTORY

IN SOUTH OF ENGLAND

present contracts expiring at end of year, seeks to negotiate new production work. Capstan and Auto turning $\frac{3}{8}$in. to $1\frac{3}{8}$in., milling, drilling, grinding, thread milling and gear hobbing.

BOX D112, MACHINERY,
Clifton House, Euston Road, N.W.1

ABBEY **HEAT TREATMENTS** LTD.

PLAZA WORKS, HIGH STREET, MERTON, S.W.19

FOR ALL TYPES OF HEAT TREATMENT

A.I.D. **WE COLLECT-WE DELIVER** D.I.

A.R.B. **TELEPHONE: CHErrywood 2291** Arm.

FREDERICK W. EVANS LTD.
Plastic Works, Long Acre, Birmingham 7.
Tel. East 3071-2-3

CAPACITY FOR

CENTRELESS GRINDING...

·01in. UP TO 3·50in. DIA. TO PRECISION LIMITS ON 'CINCINNATI' AND OTHER WELL KNOWN MAKES OF MACHINES

ALLEYNE FOSTER ENG Co. LTD
ESTABLISHED IN 1924
59 South St., Epsom, Surrey, Epsom 2198

CASTINGS

ECLIPSE FOUNDRY

& ENGINEERING CO. (DUDLEY) LTD.
SEDGLEY ROAD WEST
TIPTON ● STAFFS.

GREY IRON	ALUMINIUM	NON-FERROUS	MAZAK
Jobbing Castings up to one ton	*Sand & Die Castings*	*Gunmetals Phosphor-Bronze*	*Pressure Castings*

Repetition Machine Moulded Work

••MACHINING••

AUTO TURNED PARTS

FINE TOLERANCES, MAX. DIA. $1\frac{5}{8}$in.
INDEX SS & GRIDLEY MULTI AUTOS
THREAD CHASING MANUFACT'RS
ROLLER BOX TOOL HOLDERS

BENTON ENGINEERING CO., LTD.
Tonbridge Road, Harold Hill, Essex
Ingrebourne 43864/5.

COMPREHENSIVE CENTRE LATHE CAPACITY available up to 3ft. dia. to tool room limits. Particular attention given to individual requirements.—R.E.H PRECISION ENGINEERS, BAGSHOT ROAD, BRACKNELL, OR 'PHONE BRACKNELL 1441.

Luton Engineering Pattern Co. are prepared to undertake the manufacture of all classes of wood and metal patterns, and accuracy and prompt delivery guaranteed.—Send your enquiries to 89A Princes Street, Luton. 'Phone: 961.

Capstan Turning is Our Business

PROMPT ACCURATE SERVICE
14 DAY DELIVERY
ILFEX METALS LIMITED,
SELINAS LANE, DAGENHAM, ESSEX
Tel: DOM 6700

Centreless Grinding Capacity Infeed Plunge $\frac{1}{16}$in. to 4in.—CHISWICK ENG'G., LTD., Pluckington Place, Southall, Middx. Tel.: Southall 2247.

Automatic Capacity Immediately available. Swiss type machines up to $\frac{3}{8}$in. dia.—E. V. IRONS, Clovelly Works, 272 Acton Lane, Chiswick, W.4. CHiswick 1007.

PROTOTYPE & PRODUCTION

ELECTRONIC WIRING, COIL WINDING, INSTRUMENTATION & TESTING

SETON CREAGHE ENGINEERING LTD.,
G. W. Trading Estate, Park Royal Road, N.W.10.

A.I.D. ELGAR 3354/7 A.R.B.

AUTO CAPACITY

6in. and 4in. Chucking.
$\frac{3}{16}$in.-2in. dia. Bar, A.I.D., A.R.B. approved.

HUNTLEY & SPARKS LTD
James Estate, Western Road, Mitcham, Surrey

Automatic Capacity Available, Index single spindle autos, up to $1\frac{3}{8}$in. dia.—PRESS & PRODUCTION MACHINE TOOLS, LTD., 97, High Street, Teddington. TED Lock 4032.

Thread Milling for the Trade up to 6in. O.D. and 5in. I.D. Any thread, any quantity. Keen prices for long runs. Satisfaction guaranteed.

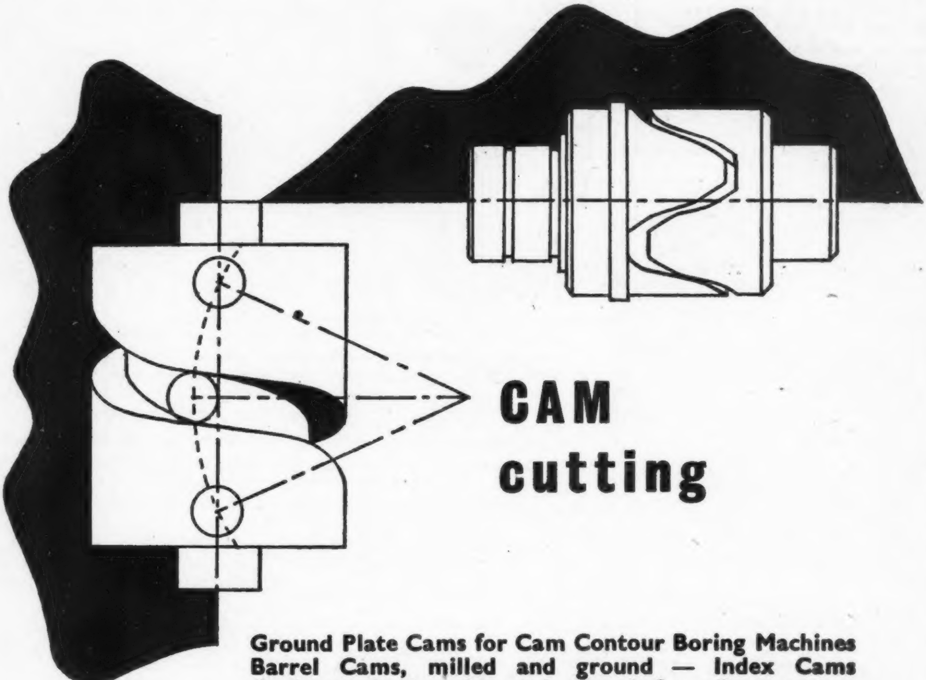
UNICORN PRODUCTS, LTD., 119-121, Stanstead Road, Forest Hill, London, S.E.23. Telephone: Forest Hill 7688 (3 lines).

ASHTEAD ENGINEERING CO. LTD.

FOR THREAD MILLING AND CENTRELESS GRINDING

GROVE RD., ASHTEAD, SURREY
PHONE: ASHTEAD 802

ESTABLISHED 1920
A.I.D. & A.R.B. APPROVED



CAM cutting

Ground Plate Cams for Cam Contour Boring Machines
Barrel Cams, milled and ground — Index Cams
Conjugates — Experimental Camshafts — Gangmasters
Ground Pump Cams — Rings and Piston Cams

zephyr cams ltd.

Freemantle Rd., Lowestoft, Suffolk.
Tel: Lowestoft 1784

Classified Advertisements (*CONTRACT WORK, contd.*)

PRECISION TURNED PARTS
D.G.I. and A.R.B. APPROVED
AUTO & CAPSTAN QUANTITIES
Send your specification to:
AYLESBURY TURNED PARTS (True Screws) Limited
Britannia St., AYLESBURY, Bucks.
Telephone: AYLESBURY 2424 (3 lines)

Automatic and Capstan Capacity Available up to 2in. dia.—WILLIS ENGINEERING, 65, High Street, Hampton Hill, Middlesex. Molesey 4273.

Automatic Capacity Available on single spindle machines.—BARMAC ENGINEERING COMPANY, Bridge Works, Iver Lane, Cowley, Middlesex. Telephone: Uxbridge 38839.

Planing Capacity, Heavy or Light
Turning up to 5ft. diameter.
Special machines to customers' design.
F. ATKINSON & SONS (LONDON), LTD., 65, King's Cross Road, W.C.1. Terminus 4050.

Capacity Turning, Capstan milling, drilling, die and tool making.—MILLS ENGINEERING PRODUCTS, LTD., Barnet. Tel.: BARnet 6744.

Automatic Capacity Available, Index single spindle Autos. up to 2¾in. diameter. Centreless Grinding Capacity, ⅛in. to 5in. diameter.
JAN PRECISION SCREWS, 629, Spur Road, Feltham, Middlesex. Telephone: Feltham 4282/3.

Multi-spindle and Single-spindle Auto Turning up to 2in. bar capacity capstan turning from the bar up to 2½in. dia., chuck work up to 14in. dia., thread milling milling, shaping, drilling, etc., capacity available. Any tolerance and quantity. Satisfaction absolutely guaranteed.—UNICORN PRODUCTS, LTD., 119-121, Stanstead Road, Forest Hill, S.E.23. 'Phone: FORest Hill 7688 (8 lines).

FINE LIMIT GRINDING
MILLING, TURNING, DRILLING.
Complete Service Offered.
SETON CREAGHE ENGINEERING LTD.,
Trading Estate, Park Royal Road, N.W.10
A.I.D. ELGar 3356/7 A.R.B.

Automatic Capacity Available. Index Autos. up to 2½in. diameter. Chucking up to 5in.
JAMES HARRINGTON, Magda Works, Walton-on-Thames. Tel.: 26099 & 25614.

Capstan Capacity Immediately Available, 8 BA-1½in. Steel or Brass. Large stocks of raw materials.
SACRON, LTD., 7, Chiswick High Road, W.4. Tel.: CHIswick 3595.

High Precision Grinding of Tungsten Carbide and Steel Tools. Accurate profile grinding and progression tools a speciality.—S. T., LTD., 22-26, Upper Mulgrave Road, Cheam, Surrey. 'Phone: Vigilant 0074/5.

Capstan Capacity Immediately available 10 BA to 1½in. B.M.S. Stainless, Brass, etc. All materials in stock.—CHISWICK ENG., LTD., Pluckington Place, Southall, Middlesex. Tel.: Southall 2247.

CENTRELESS GRINDING SPECIALISTS
BAR GRINDING
$\frac{1}{16}$in. TO 5in. DIA. UP TO 15ft. LONG
all types of infeed, through and plunge
A.I.D. APPROVED
IMMEDIATE CAPACITY ON CAPSTAN, MILLING CENTRE LATHES, AUTO AND ALL TYPES OF GRINDING
REDCAR ENGINEERING CO. LTD. *Tel:* POPESGROVE 1005/6/7
8 STATION YARD GROSVENOR RD TWICKENHAM MIDDX

AIRCRAFT UNIT ENGINEERING CO.
invite quotations for machining capacities
A.I.D., A.R.B., AND LIMITED A.R.B. DESIGN APPROVAL
Turning, Capstan and Centre Lathe. Milling, Universal, Profile. Grinding, universal, surface, centreless, etc. (up to 86in. x 15in. dia. Plain Cylindrical)
Screw Cutting (Cridan machines) and Thread Milling
General Assembly Work Modern plant producing High Quality work
18-19, Greenhill Parade, Great North Road, New Barnet, Herts.
Telephone: BARnet 6471 and 7479

Precision Turned Parts, Auto ⅜in., Capstan 2in. Milling, Grinding, Heat Treatment, etc. A.I.D., A.R.B.
S.M.E. LTD., Steyning, Sussex. 'Phone Steyning 2228.

Automatic Work up to 1½in. Immediate capacity available.
TRUE ENGINEERS, LTD., Wharf Lane, Bourne End, Bucks. 'Phone 1316.

WE MAKE TANKS, FRAMES, DUCTS, INSTRUMENT PANEL AND CHIMNEYS
Let us have your enquiries for welded fabrications large or small. And we can press 200 Tons, guillotine bend and cylindrical roll ¼in. plate.
SHELMERDINE & MULLEY LIMITED
EDGWARE ROAD, CRICKLEWOOD N.W.2.
Tel: GLAdstone 7677-8

CAPSTAN CAPACITY IMMEDIATELY available from 0.050 dia. to 30in. in any specified material. Extremely rapid service.—R.E.H. PRECISION ENGINEERS, BAGSHOT ROAD, BRACKNELL. 'PHONE: BRACKNELL 1441.

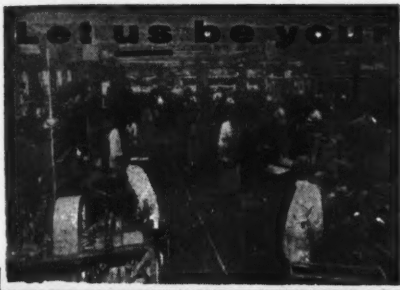
Automatic Capacity Available, B. & S. up to 1½in. dia.—C.B. AUTOMATICS, Bridge Works, Iver Lane, Cowley, Middlesex. Tel.: Uxbridge 33428.

Spur Gear and Sprocket Cutting from blanks supplied or machined complete. 'Phone: EUSton 1354.
TURNER BROS. 10, Pratt Mews, Camden Town, N.W.1.

Gear Cutting, Auto Turret, Capstan and Centre Lathe Turning, Milling, Planing, Hardening and Grinding, Profile Cutting and Welding.
SMITH & NETHERWOOD, LTD.
Tanyard Road, Quarmby, HUDDERSFIELD.
Phone: MILNSBRIDGE 1865.

Automatic Capacity Available on Index single spindle autos, up to 2½in. dia.—ARTHURS ENGINEERING, LTD., Hersham Trading Estate, Molesey Road, Hersham, Surrey. 'Phone: Walton-on-Thames 21277.

E. R. LATTIMER LTD
Offer complete Service for
PRECISION PROFILE MILLING, JIG BORING
CENTRELESS, SURFACE AND UNIVERSAL GRINDING
LIGHT TO MEDIUM COMPONENT MANUFACTURE
TOOL DESIGN & MANUFACTURE
SMALL ASSEMBLIES DIE & MOULD MANUFACTURE
SMALL PRESSURE DIE CASTING IN MAZAK ALLOY TO BS 1004
SUPER PRECISION HYDRAULIC COMPONENTS AND ASSEMBLIES
FOR WHICH WE HAVE HYDRAULIC TESTING EQUIPMENT
AID & ARB APPROVED
SHAKESPEARE STREET SOUTHPORT
Phone: 57696/7



Let us be your machine shop!

COMPLETE FACILITIES

plus precision and service second to none!

Capstan and centre lathe work · Milling—all types
Surface and universal grinding · G-SIP jig boring . . .
as well as drilling, shaping, honing, centreless grinding, copy turning, thread milling, "Cridan" screw cutting, toolmaking etc., to suit your every need.

A I D & A R B

Telephone · Elmbridge 5333 (3 lines)

MARSDEN & SHIERS LTD · DAVIS ROAD · CHESSINGTON · SURREY

V. J. COPAS LTD.,
Friar Park Road,
WEDNESBURY, STAFFS.
Tel: Wednesbury 1051/3

Precision Engineers, Instrument Makers, offer complete machining and/or assembly capacity for light to medium components in prototype or batch production quantity. All metals.

Centre lathes to 6in. capacity.
Capstans $\frac{1}{16}$in. to $2\frac{1}{2}$in. capacity.
Milling, drilling and cylindrical grinding.
D.G.I. & A.R.B. fully approved.

HORIZONTAL AND VERTICAL MILLING to Toolroom limits from 1 off to 100 off, from large fabrications to small jigs or fixtures.—R.E.H. PRECISION ENGINEERS, Bagshot Road, Bracknell.

MACHINING

W. G. MARSDEN ENG. LTD
CAPSTANS · TURRET LATHES · AUTOS
LATHES · MILLS · DRILLS · GRINDERS
COMPONENTS & ASSEMBLY PRODUCTION
FULL MACHINE SHOP SERVICE
JIGS · TOOLS · GAUGES · PRESS TOOLS
30 FIFE ROAD - KINGSTON - ON - THAMES
KINGSTON 6112

CAPACITY

SCOTT ENGINEERING (BOURNEMOUTH) LTD.
68, Old Wareham Road, Parkstone, Dorset

has available for approx. 500 hours per week light-medium milling and turning capstan and welding capacity in the commercial field.

Auto Screw Products, Ltd. Castle Works, Tipton Road, Dudley. Tel. Dudley 55103-4. Capacity available for automatic screw machine work, capstan milling, drilling and presswork. Repetition products for all industries made to customers' specifications in any quantity. Nuts, Bolts, Screws, General turning, tool design and manufacture.

FOR
THREAD MILLING
CONSULT
BROWN'S ENGINEERING WORKS
Dudden Hill Lane, N.W.10.
'phone: Dollis Hill 7941

DELANCEY
TOOL & ENGINEERING WORKS LTD.
A.I.D., ADMIRALTY & WAR OFFICE APPROVED

CAM CUTTING & GENERAL MACHINING
FITTING & EXPERIMENTAL WORK
PROMPT SERVICE
DELANCEY ST. LONDON, N.W.1
Telephone: GULLIVER 3448

LIMITED NUMBER OF PRECISION GRINDING HOURS AVAILABLE
Surface, Surface Form, Cylindrical, Steel, Tungsten, Carbide and Quartz.
SOUTHERN TOOLS LTD.,
22/26, Upper Mulgrave Road, Cheam, Surrey Phone: Vigilant 0074

THE AVENUE ENGINEERING CO
GENERAL ENGINEERING CAPACITY
7, Warner Yard, Warner Street, Mount Pleasant, Clerkenwell, E.C.1
Telephone: TERminus 2209

All Kinds of Firms Send All Sorts of Machines to TIMS ENG. CO., LTD., Horizontal Boring, Centre Lathe, Capstan and Combination Turret Turning. Vertical and Horizontal Milling. Grinding. Jigs. Tools. Fixtures. Moulds. Welding. Fabrications. Special machines. 1 off to batch production.—50, Bard Road, Latimer Road, W.10. LAD 7711.

Immediate Capacity Available on Single Spindle Automatics up to $1\frac{1}{4}$in.—HARRADINE AUTOMATICS, Forge Works, Pleasant Place, Hersham, Surrey. 'Phone: W.-on-T. 24914.

•PRESS WORK•

Press Tools, Jigs and Fixtures Light Pressings up to 40 tons.—SPENCE TOOLS, LTD., 361A, Oxford Avenue, Trading Estate, Slough. Tel.: Slough 22394.

PRESS WORK

Capacity available for short or long runs—in all metals, including stainless steel—up to 150 tons 30in. blank.

W. M. STILL & SONS LIMITED
29/31 GREVILLE STREET, LONDON, E.C.1
TEL: HOLborn 3744

RELIABLE SERVICE · COMPETITIVE PRICES · A.I.D. APPROVED

PRESS WORK

INCLUDING DEEP DRAWING, WELDING AND SUB-ASSEMBLY

to any tolerance, shape or quantity

ECONOMIC STAMPINGS LTD., DISRAELI ST. LEICESTER Tel: 32233

NAISH BROS. & CO. LTD.,
KNAPPS LANE, ST. GEORGE, BRISTOL 5 Tel: 657204/5

PRESS TOOLS
FIXTURES
SPECIAL MACHINES
PRESSINGS
GEARS

Pressings in all Metals up to 60 tons. Press tools manufactured in our own toolroom. Light assemblies. Domestic Electrical and Mechanical. All finishes. A.I.D. and A.R.B. approved. Advice and estimate given free. Inquiries to:—

METAL COMPONENTS, LTD.,
Dolphin Road, Shoreham-by-Sea, Sussex.
'Phone: Shorehan-by-Sea 2224/5.

Press Productions

Pressings on auto or hand fed presses. Immediate capacity up to 40 tons. Production from our, or customer's, tooling. A.I.D. approved.—Summersby Road, Highgate, N.6. TUDor 9851.

A.I.D., C.I.A., A.R.B., APPROVED

WELDING & FABRICATIONS

PRESSINGS

PRESS CAPACITY UP TO 1000 TONS
· ALL MATERIALS ·

POLARCOLD LTD.,
CONGLETON · CHESHIRE TEL. 2401/3

The Wembley Tool Co., Ltd., Bridge Road, N.W.10, are extending their premises and can offer immediate press capacity on a new range of H.M.E. presses from 75 to 12 tons. Also 6 ton roll feed, and 20 others double action and horning. Guillotine 6ft. × ¼in. spot welding and assembly, own toolroom. 'Phone: Wil 6667 Now.

SUB-MINIATURE PRESSINGS
and multi-stage precision presswork in all materials
PROMPT DELIVERIES
G. A. PRECISION PRODUCTS LTD.
No. 2 Factory Darkes Lane, Potters Bar, Middlesex
Potters Bar 6895.

METAL SPINNINGS
IMMEDIATE CAPACITY FOR METAL Spinnings, Sheet Metal Work, Welding. A.I.D. Approved M.O.S. Ref. 8026/57
HIGHBURY METAL SPINNING CO. (1955) LTD.
30 HIGHBURY PLACE, N.5. CANonbury 2906

TOOLMAKING

PRECISION PRESSWORK

Own Toolroom
Double action deep drawing
Double roll feeds

HOLLY ENGINEERING (Drayton) LTD
COLHAM AVENUE · YIEWSLEY · MIDDLESEX
Telephone: West Drayton 2870

Kellering and Cam Profiling capacity up to 8ft. by 6ft. or 6ft. diameter.

ARMYTAGE BROS. (KNOTTINGLEY) LTD.,
The Foundry, Knottingley, Yorkshire.
Telephone: Knottingley 2743/4.

TREVENA & GLOVER LTD
Specialists in Intricate Presswork
309-312 ICKNIELD STREET
BIRMINGHAM 18.

Quality contacts for the Electrical Industry.
Small and Medium Presswork in all ferrous and non-ferrous metals.
Telephone. B'ham Northern 0258.
ON AIR MINISTRY LIST
CONTRACTORS TO THE G.P.O.

Pressings and Stampings, Ltd., Eccleston Road, West Ealing, W.12. Presswork up to 130 tons. Double action deep drawing guillotine 3ft. by 10 s.w.g. Spotwelding. Assembly. Toolmaking and electroplating.—'Phone: Ealing 3667-8.

KEMP

PRECISION TOOLING LTD

37 JUNCTION ROAD, CROYDON, SURREY
TELEPHONE: CROYDON 5658

PRESS TOOLS, JIGS
GAUGES, MOULDS
SPECIAL PURPOSE MACHINES
PROFILE GRINDING
PRECISION COMPONENT PRODUCTION
JIG BORING

Classified Advertisements (*CONTRACT WORK, contd.*)

JIG BORING

JIGS - FIXTURES
PRESS TOOLS
PROTOTYPE MACHINING

WEST GREEN TOOL CO.
KINGS ROAD · WOOD GREEN · N.22
Telephone: BOWES PARK 5144

GROSVENOR WORKS (Holloway) LTD.
Station Road, Tottenham Hale, N.17
Telephones: TOTtenham 7782/3

PRECISION ENGINEERS

Press Tools. Metal Stampings.
Special Purpose Machines.
Precision Machined Components.
Jig Boring.

HIGH QUALITY
PRESS TOOLS

MULTI-OPERATION TOOL
• SPECIALISTS •
STAMPINGS IN ALL MATERIALS
FIXTURES - JIGS - MOULDS
SPECIAL PURPOSE MACHINES

W. T. Atkin (TOTT) Ltd.
178 ST. ANN'S ROAD, LONDON N.15
Telephone STAMFORD HILL 6636/7

JIG BORING

ON SIP JIG BORERS

EDMONTON TOOL & ENG. CO. LTD
HERTFORD ROAD ... N.9
TELEPHONE: EDMONTON 4412/3
SPURS, SPIRALS, BEVELS, WORMS
& WORM WHEELS

GEAR CUTTING

Tungsten Carbide Tool
Manufacturers of standard and special form tools in high speed steel and tungsten carbide.
Our range includes reamers, cutters, workrest blades and wear-resistant parts.
Carbide supplied to customers specifications and express service given for emergency tooling.

DIAGRIT GRINDING CO., LTD.,
Station Road, Staplehurst, Tonbridge, Kent.
'Phone: Staplehurst 449.

MACDOWALL

JIGS, FIXTURES
PRESS TOOLS & GAUGES
PRECISION ENGINEERS
SPECIAL MACHINERY

ROMFORD 61981

MACDOWALL EQUIPMENT
COMPANY LIMITED
NORTH STREET
ROMFORD, ESSEX

SIGN OF
KEMWORTHY
A GOOD TOOL

Send Us Your Enquiries

'PHONE:
LIBERTY 5203.

THE KEMWORTHY JIG & PRESS TOOL COMPANY LTD.,
NELSON WORKS, LYON ROAD, MERTON, LONDON, S.W.19.

COVENTRY GRINDERS LTD

AID, ARB Approved Phone 73344

Send us your enquiries for

GAUGES, FORM TOOLS, DIES,
PROTOTYPE, COMPONENTS,
MANDRELS, CRUSHERS, JIGS,
GEAR CUTTING, OPTICAL FORM
GRINDING, CENTRELESS
INTERNAL, EXTERNAL, SURFACE.

ALL SIZES
OF PRECISION
GROUND
GAUGEPLATE
IN STOCK
$\frac{1}{32}$ to 18in.
WIDE
$\frac{1}{32}$ to $1\frac{1}{4}$in.
THICK
18in. to 48in.
LONG.

Classified Advertisements (*CONTRACT WORK, contd.*)

QUALITY TOOLS
PRESS TOOLS • JIGS • FIXTURES
SPECIAL PURPOSE MACHINES
MACHINING
MAYSMITH
ENGINEERING CO. LTD.
290a High Road, Willesden, N.W.10
A.I.D. Tel: WIL 6688/9 A.R.B.

EST^{D} 1889
R. STEPHENS & SON LTD
PRESS TOOLS · JIGS
FIXTURES · MOULDS
GAUGES · DESIGNS
115 CHURCH ROAD
UPPER NORWOOD
LONDON S.E.19
PHONE LIVingstone 2265-6

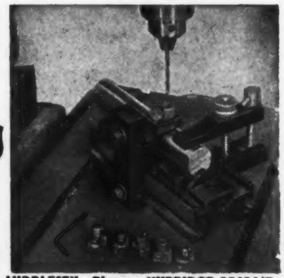
•WORK TO PLACE•

Large Engineering Company in London wishes to sub-contract work in the following capacities. Medium Capstan, Turret Lathes, Vertical and Horizontal Boring, Medium and Large Planing, Milling, Radial Drilling, Grinding, Centre Lathes, etc.—Please send particulars of plant to BOX C715, MACHINERY, Clifton House, Euston Road, N.W.1.

SPECIALITIES

LISTERS SOFT JAWS
PRATT, COVENTRY
AMERICAN & CONTINENTAL
Please send your enquiries to:
SOLE AGENTS LONDON & SOUTH
W. J. L. (MACHINERY) LTD.
DACRE HOUSE, DEAN FARRAR STREET,
LONDON, S.W.1. *Tel: WHItehall 2018*

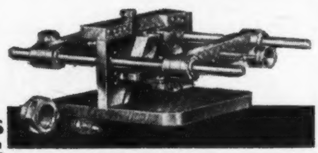
WEATHERALL
Universal
CROSS PIN HOLE *Drilling Jig*



Built in two sizes, with capacity of up to 1in. and 1¼in. die stock respectively, this jig ensures the speedy and accurate drilling of round stock. Fully adjustable vee blocks and drill bush carrier. Supplied complete with jig bushes.
Write for details.
A. WEATHERALL & CO. LTD.
WALLINGFORD ROAD TRADING ESTATE · UXBRIDGE · MIDDLESEX Phone: UXBRIDGE 35696/7

DONOVAN
FOR THE
MACHINE TOOL BUYER
WHO REQUIRES
PLASTIC INSULATION CABLES, P.V.C. COVERED & PLAIN FLEXIBLE CONDUIT, B.S.A. ACME SNAP-LOCK LIMIT SWITCHES & MICRO LIMIT SWITCHES AMMETERS, H.R.C. FUSE CARTRIDGES & SLYDLOCK FUSES, FLUSH MOUNTING ISOLATING SWITCHES, BILL & M.E.M. SWITCHGEAR.
The Donovan Electrical Co. Ltd.,
(Wholesaling Division)
Granville Street, Birmingham, 1

FOR ALL
LOCKING WIRE HOLES
THE **HEXIJIG**



DOES THE JOB FASTER AND BETTER

CONSIDER THE SAVING IN TIME AND MONEY
- Accepts all hexagons in common use.
- When a run is finished simply transfer to the next job.
- No idle jigs in store.
- Less capital outlay.
- A real winner for short runs as well.
- Reduces Tool Room and Drawing Office work.
- Drills through the flats or corners.

THE STANDARD TOOL FOR THIS CLASS OF WORK

Write **NOW** for illustrated brochure to:—
Z. BRIERLEY LTD
ENGINEERS TOOLS & SUPPLIES
QUEENS ROAD WORKS LLANDUDNO N. WALES Phone 76970

BALL & ROLLER BEARINGS

THE WORLD'S LARGEST SELECTION OF
BRITISH, AMERICAN AND CONTINENTAL BEARINGS IN ALL TYPES AND SIZES
IMMEDIATE DELIVERY FROM STOCK · KEENEST PRICES

CLAUDE RYE BEARINGS

895-921 FULHAM ROAD · LONDON · SW6
PHONE RENOWN 6174 (Ext 24) TELEX 23453 CABLES RYE BEARINGS, LONDON
Slough Branch 60 BATH ROAD, SLOUGH Phone SLOUGH 22354 • Kingston Branch 88 LONDON ROAD, KINGSTON Phone KINGSTON 6755 & 4142

Classified Advertisements (SPECIALITIES, contd.)

REAMERS, MILLING CUTTERS, END MILL
DIEHEAD CHASERS, HAMMERS,
SLITTING SAWS, LATHE TOOLS, TOOLBITS
WOLF ELECTRIC TOOLS, HEIGHT GAUGES,
DRILLING MACHINES, DRILL CHUCKS,
MICROMETERS, SHEFFIELD & SWISS PATT FILES
INDICATOR SETS, FLEXIBLE SHAFT MACHINES

THEY'RE STOCK AT

RITCHIE

ALL SIZES OF STANDARD & SPECIAL HIGH SPEED DRILLS & TAPS FROM STOCK

A. H. RITCHIE & CO., LTD., SOUTHWARK ST., LONDON, S.E.1
TELEGRAMS: RITOLS, SEDIST, LONDON. TELEPHONE: HOP 2132 (6 lines)

LAPPEX

micronised
LAPPING COMPOUND
for machine and hand use

Gives a superfine scratch-free Mirror finish on steels, non-ferrous metals and many plastics.
Lappex 7/6 tube 20 grms
Lappex Vehicle 3/- tin 4ozs

THE GENERAL ENGINEERS SUPPLY CO (1937) LTD
555 High Rd. Leytonstone E.11
Ley 6677 & 5685

ROTARY COMPRESSORS & EXHAUSTERS
Manufactured by
THE HAMMOND ENG. CO., LTD.,
Chase Side, Enfield, Middx.
Telephone: ENF. 1323 (3 lines)

CIRCLIPS
all types from stock
ELLISON SPRING CLIPS LTD., BINGLEY YKS.
Tel: CULLINGWORTH 6836/7

Universal Ball Bearing Co.
111-115 Hammersmith Grove, London, W.6
FACTORS
MANUFACTURERS
AND REPAIRERS
Phone: Riverside 3261-2-3-4
Grams: "Universal Bearing Hammersmith"

ABOUT AMMUNITION BOXES
THOUSANDS OF STEEL AND WOODEN BOXES OF ALL SIZES
Ideal for all Types of Packing & Storage purposes.
For particulars and prices apply:—
O.K. TRADING (B'HAM FACTORS) LTD.
78-84, MOAT LANE, B'HAM 26
STEchford 4351/2 P.B.X.

'WORTH'
PIPE UNIONS
for Steam, Water, Oil or Gas.
NEVER LEAK
WALTER SLINGSBY & CO., LTD.
WASK WORKS KEIGHLEY

The "Coxeter" Revolving Centre from 70s. All sizes from stock.—REVOLVING CENTRES, LTD., Oxford.

TIME RECORDERS—Sales— Rental Service; Tel. Hop. 2239.
TIME RECORDER SUPPLY & MAINTENANCE CO., LTD.,
157/159, Borough High Street, London, S.E.1

ANNOUNCEMENTS

Sogenique (Service) Ltd., a British subsidiary of Societe Genevoise d'Instruments de Physique have acquired a controlling interest in Reilly Engineering Ltd.

PROPERTY FOR SALE

PRECISION ENGINEERING WORKS
10 miles North-East Manchester
FOR SALE AS A GOING CONCERN
BUILDINGS 21,000 sq. ft. floorspace with land for extension.
80 MACHINE TOOLS AND EQUIPMENT including:—Capstan, Turret and Centre Lathes; Surface, Cylindrical and Thread Grinders; Single and Multi-spindle and Radial Drills, Milling, Shaping, Surfacing, Boring Machines and Overhead Travelling Cranes.
Further particulars from:
G. F. SINGLETON & CO.
Industrial Estate Agents
Lloyds Bank Buildings
53 King Street, Manchester 2.
(Tel.: Deansgate 7954/8.)

PATENTS—TRADE MARKS

Kings Patent Agency, Ltd. B. T. KING, A.M.Inst.E., Registered Patent Agent, 146A, Queen Victoria Street, London, E.C.4. City 6161. Booklet on Request.

AGENCIES

Representatives Calling on Engi-neering and allied trades wishing to handle further line on good commission terms.—Apply to METALLOID ENGRAVING, 69, Knights Hill, S.E.27. Gipsy Hill 2464.

Agent. Old Established Com-pany (London Area) requires Agent with entry to users of Mazak pressure diecastings in London and Southern England.—Write BOX D153, MACHINERY, Clifton House, Euston Road, N.W.1.

MATERIALS FOR SALE

MILD STEEL PLATE

Surplus to Requirements, the following Mild Steel Plate in excellent condition.

8¼ tons $\frac{15}{16}$in. × 60in. × 120in.
45¼ tons 1in. × 60in. × 120in.
63¾ tons 1¼in. × 60in. × 120in.
113¼ tons 2½in. × 60in. × 120in.
63¼ tons 3½in. × 60in. × 120in.
41 tons 4½in. × 60in. × 120in.
44 tons 6in. × 60in. × 120in.

The above material will be sold at cost price.—Enquiries to BOX D151, MACHINERY, Clifton House, Euston Road, N.W.1.

Storage Bins, 18in. × 10in. × 5in. deep 3s., Pressed Steel Shelves 4ft. 6½in. × 9½in. × 16 gauge 2s. 6d. Good condition.—LOWTON METALS, LTD., Sandy Lane, Lowton St. Mary's, Leigh 71441/2.

Surplus Mild Steel For Sale, 20G to 14G. Offset 30G to 14G. Cold Reduced and Hot Rolled Strip Mill, 6 or 8 by 22G template.—E. STEPHENS & SONS, LTD., Bath Street, E.C.1. CLE. 1731/4.

MATERIALS WANTED

£200,000
AVAILABLE FOR THE PURCHASE OF
NEW BALL & ROLLER
BEARINGS
OF ALL TYPES & SIZES
BY BRITAINS BIGGEST BUYERS
CLAUDE RYE BEARINGS
895-921 FULHAM RD. LONDON SW6
RENOWN 6174 (Ext 24). TELEX 2-3453

PACKING AND SHIPPING

R. & J. PARK, LTD., Dominion Works, Chiswick, England. Export packers, shippers, and forwarding agents. specialists in packing heavy machinery.

PHOTOGRAPHY

Miles & Kaye, Ltd., 102, South- ampton Row, London, W.C.1. Holborn 6858. Specialists in commercial and industrial photography for over 60 years. All branches of photographic work undertaken.

Photographs by MACHINERY set the standard in engineering publicity. Our studio is one of the best equipped in the country. Ideal for really good photography of tools, attachments and portable equipment. Mobile units available for taking photographs in black and white or in natural colour in your own or your customers' works. Specimens of work submitted on request.—Full particulars from the SERVICE MANAGER, MACHINERY PUBLISHING COMPANY, LTD., National House, West Street Brighton, 1.

PLANT WANTED

B.G. MACHINERY, LTD., Montgomery Street, Sparkbrook, Birmingham, 11, will pay good prices for Machine Tools of first-class make and in good condition. 'Phone VICtoria 2351/9.

WANTED
MODERN MACHINE TOOLS

We pay cash for single machines or complete plants

SEND US DETAILS
IMMEDIATE INSPECTION ARRANGED

SOUTHERN ENGINEERING AND MACHINERY CO.
CONNAUGHT BUILDINGS,
TANNERS BROOK, MILLBROOK,
SOUTHAMPTON
Telephone: Southampton 73101/2/3

A 4in. Horizontal Forging Ma- chine, this must be a modern machine and fitted with pneumatic clutch.—BOX D150, MACHINERY, Clifton House, Euston Road, N.W.1.

M.R.E. Double Headed Centring machine.—BOX D152, MACHINERY, Clifton House, Euston Road, N.W.1.

Urgently Required. Plain Cylindrical Grinder, approx 6in/8in height of centres. It is important that the headstock has at least 1½in. dia., hollow spindle. Between centres unimportant.—THOMPSON MACHINE TOOLS, LTD., Salmon Pastures Works, 270, Attercliffe Road, Sheffield, 4.

WANTED
All types of modern
MACHINE TOOLS
Chipping Sodbury 3311
NEWMAN INDUSTRIES LIMITED
YATE · BRISTOL

CENTAUR TOOL WORKS Birmingham, 18, pay best prices for good modern secondhand Machine Tools by first-class makers. Write or phone and our representative will call.—'Phone EDGBASTON 1118 and 1119. 'Grams: Capstan, Birmingham.

Longford Machine Tool Co., Ltd., Longford Road, Coventry, will pay good prices for any type of machine tool which is in good condition, and is of first class make. Only machines motorised 400/3/50 will be considered. —Write or 'phone Coventry 87481/2.

WE WILL PURCHASE Modern quality Machine Tools for cash. Whole plants or individual items. Full details to—

HARRY KIRK ENGINEERING, LTD.,
Machine Tool Division,
Brandon Road Works,
Brandon Road, Coventry.
Telephone: Walsgrave-on-Sowe 2253/6.

WANTED

Good Class Used
MACHINE TOOLS

Write or phone

STANCROFT LTD.
BEDWORTH ROAD,
COVENTRY
Telephone: Coventry 88072

Wanted, Brown & Sharpe and C.V.A.8 Single Spindle Automatic.—MELBOURNE ENGINEERING CO., LTD., Melbourne, Derbyshire. 'Phone: Melbourne 232.

4ft. Vertical Borer Required, minimum height turret to table 42in. Reasonably modern machine in good condition. Price and full particulars.—BOX D144, MACHINERY, Clifton House, Euston Road, N.W.1.

Wanted: Gap Gauge Grinding machine, Jones & Shipman model 710 or similar type. Also Electric swivelling magnetic chuck, approx. 10in. × 4in., with or without rectifier.—BOX D145, MACHINERY, Clifton House, Euston Road, N.W.1.

Newall Jig Borer Wanted urgently. Any condition considered.—BOX D84, MACHINERY, Clifton House, Euston Road, N.W.1.

Power Presses, Power Guillo- tines, Sheet Metal Machinery, urgently required.—STANCROFT, LIMITED, Lancaster St., Birmingham, 4. Aston Cross 3741 or 2235.

A. LAWRENCE & CO. (MACHINE TOOLS) LTD.

will be pleased to purchase your surplus Modern Machine Tools either on a cash or part exchange basis. Ask our representative to call and inspect.

Welsh Harp, Edgware Road, London, N.W.2
Telephone: GLAdstone 0033

DOUGLAS
OF HIGH WYCOMBE

★ We would be pleased to Purchase your surplus Modern Machine Tools.
★ Generous offers made for Latest Style Machines.
★ Inspection Arranged at Once.
★ Britan Repetition Lathes a Speciality.
★ Cash or Part Exchange Basis.

A. DOUGLAS CO. LTD.
LINCOLN ROAD,
HIGH WYCOMBE,
BUCKS.
Tel: H.W. 4390 (5 lines).

Classified Advertisements (PLANT WANTED, contd.)

FRYE arrange immediate inspection of good class plant
POYLE ROAD · COLNBROOK · SLOUGH · BUCKS · COLNBROOK 2442/3/4
MACHINE TOOL COMPANY LIMITED NEAR TO LONDON AIRPORT

Wanted Urgently

Late Type Machine Tools
Best Prices are offered for latest types of Machine Tools. Send us details of what you have and our representative will call to inspect.

J. B. MACHINE TOOL CO. LTD.
312 BRADFORD ST., BIRMINGHAM 5
Telephone: MIDland 4375

WANTED GOOD MACHINE TOOLS
Offer your Surplus Tools to us.
We pay a good price.

M. WARD
(MACHINE TOOLS) LTD.
1, KILBURN HIGH ROAD,
LONDON, N.W.6.
Telegrams: Emwarneers, Kilb, London.
One minute from Kilburn Park Station, Bakerloo Railway.

WANTED!

GOOD CLASS MACHINE TOOLS POWER PRESSES & SHEET METAL MACHINERY

EDWIN MILLEN & SONS LTD.
70 Clerkenwell Road, London E.C. 1
'Phone: CLErkenwell 6064

Machine Tools, Power Presses, and Sheet Metal Machinery. Single machine or complete plant purchased. Immediate Inspection.—ALBERT EDWARDS (MACHINERY), LTD., 79/89, Pentonville Road, London, N.1.

Wanted, Good Class Machine Tools and Sheet Metal Machinery, particularly of post war design.—H. BELL (MACHINE TOOLS), LTD., Walter Street, Leeds, 4. Tel. 62-7398

Albert Edwards
(MACHINERY) LTD.,
79/89 PENTONVILLE ROAD
LONDON, N.1.
Telephone: TERminus 0167/8/9

We are buyers of good modern machine tools

WANTED!

USED MACHINE TOOLS
We offer generous prices for your plant or accept in part exchange for modern equipment

E·H·JONES
(MACHINE TOOLS) LTD
48, HIGH STREET, EDGWARE
Telephone: EDGware 4488
Midland 5593 Birmingham

MCL

WE ARE KEEN BUYERS OF GOOD MODERN MACHINE TOOLS. INSPECTION WILL BE ARRANGED AT ONCE.

M. C. LAYTON LTD.
Abbey Wharf,
MOUNT PLEASANT
ALPERTON, MIDDLESEX
Telephone: WEMbley 9641-8

WANTED. Secondhand Cold Circular Saw, Capacity 24in. to 38in. diameter. Must be of recent construction and Motorised for 400/440 volts, 3 phase, 50 cycles.
Full details to:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

URGENTLY REQUIRED
No. 5 Wide Bed KEARNS Horizontal Borer.
No. 6 RICHARDS or small Floor Borer.
Planing Machine 8ft. 0in. wide (Minimum), by 20ft. 0in. stroke.

BOX D 156 MACHINERY,
CLIFTON HOUSE, EUSTON RD.,
N.W.1

Gordon Try Ltd
MEMBER OF THE B.A.M.T.M.

WANTED URGENTLY

ALL TYPES OF MACHINE TOOLS, GEAR CUTTING M/Cs

THE CAUSEWAY, EGHAM, SURREY
Tel: Egham 4166/7

SURPLUS MACHINE TOOLS REQUIRED
OFFER YOUR MACHINES TO

J. E. RAISTRICK LTD.
POYLE TRADING ESTATE
COLNBROOK, SLOUGH,
BUCKS.
TEL: COLNBROOK 2421

TENDERS

The Director General of India Store Department, Government Building, Bromyard Avenue, Acton, London, W.3, invites tenders for the supply of:—

24015/61/1/HSK/HAL.2

Spark Erosion Machine for Rapid Stock Removal 6/8 Cubic inches/Min. Table 28in. × 22in.

The tender forms with schedules and specifications which are returnable on Monday, 11th September, 1961, may be obtained from the above office (C.D.N. Branch) on payment of a fee of ten shillings (not refundable) for each tender.

The applications for tenders should clearly state the above reference number.

PLANT FOR SALE

HENRY BUTCHER & CO.

Specialists in the

• VALUATION AND SALE OF FACTORIES, PLANT AND MACHINERY •

73 CHANCERY LANE, LONDON, W.C.2

TEL.: HOLBORN 8411 (8 lines) GRAMS: PENETRANCY, HOLB., LONDON

Bullard Verticalauto, D-type, 8- spindle 16/23, double indexing. Complete with compound slides and chucks.—HENRY KIRK (MACHINE TOOLS), LTD., Yate, Bristol. Tel. Chipping Sodbury 3081.

Wickstead Hydro-Resistance Hacksaw Machine, 10in. capacity. Hydlift to saw bow. 2 speeds. Motorised.—WILCOX & CO., Barr Street, Birmingham 10. NORthern 1234/5.

POWER PRESSES

NEW PRESSES

BENTLEY 80 ton geared adjustable stroke ¼in.-5in.
HERCULES 40 ton geared adjustable stroke ¾in.-3¾in.
MARTYN 18 ton Blanking Press, ½in. stroke.

USED PRESSES

JOHN SHAW 700 ton Hydraulic Press. Platen size 6ft. × 4ft.
CRAIG & DONALD 100 ton Double Sided Press, geared, 6in. fixed stroke.
RHODES Double Crank Press. Bed area 5ft. × 3ft. 6in. 4in. stroke.
DANIEL SMITH 75 ton Blanking Press. 2in. stroke.
RHODES 30 ton Horn Press. 3in. adjustable stroke.
E.M.B. 30 ton Flexi-Press. 17in. stroke.
BRADLEY & CRAVEN 25 ton Inclinable Press. 2½in. stroke.
H.M.E. 20 ton Inclinable Press. 2in. stroke.
SWEENEY & BLOCKSIDGE No. 9 Inclinable Press. 20 tons, 1½in. stroke.
HEDLEY 20 ton Inclinable Press. Adjustable stroke ½in.-3½in.
SWEENEY & BLOCKSIDGE 16 ton Inclinable Press. Adjustable stroke ½in.-2½in.
TURNER 6 ton Inclinable Press.

MARTIN POOLE LTD.,
16/20 WENMAN STREET,
BALSALL HEATH, BIRMINGHAM, 12.
Tel.: CALthorpe 3545.

American First Class Machines of all types can be supplied from our American Showrooms. Send your enquiries to K & C MACHINERY, LTD., Stephen Street, Coventry. Telephone: Coventry 53669.

Siemens Schuckert Electrically Heated Furnace, 6ft. 10in. dia., 8ft. 10in. deep, 550 deg. C., 100 kW, 400 volts.

New Process 100 kV Seam Welder, 400/3/50.

British Federal 50 kVA Flash Butt Welding Machine. 400/3/50.

Fielding 50 ton hydraulic horizontal pipe bender, up to 6in. bore hydraulic tubes.

200 Ton Fielding Downstroke Hydraulic Press, 14in ram, 42in. stroke, 63in. daylight.

100 Ton Fielding ditto. 10in. ram, 72in. stroke, 99in. daylight.

50 Ton Fielding ditto, 3ft. stroke.

Bliss 70 Ton Geared Double Sided Power Press. 400/3/50 supply.

3 Bliss No. 304 Vertical Single Action Drawing Presses, 7¾in. stroke, 50 tons. American.

Bennie Punching, Shearing and Section Cropping Machine, 4½in. × 4½in × ⅜in. angle.

Windsor 6-oz. Plastic Injection Moulding Machine.

Sedgewick Bending and Folding Machine, 6ft. × ⅛in., motorised.

8ft. × ⅜in. Bennie Bending Rolls.

7ft. × 1in. Craig Donald Flattening Rolls.

"Pyramid" Bending Rolls, 9ft. 0in. × ⅝in.

200 Tons Tangye Hydraulic Straightening Press, bed 25ft. × 3ft., stroke 21in., motorised travelling table, 2 ram pump.

Hugh Smith Double Table Scarfing Machine, 13in. fixed stroke, from 16in. to 8ft. wide, 1½in. thick steel plates.

Crow, Harvey Punch, Shears and Angle Cropper, 18in. blade, 27in. throat, heavy duty.

Pels Punch Shears and Cropper, 12in. blade, shear ⅞in. takes 6in. × 6in. × ⅝in. angles.

Robertson Shears, ⅜in. capacity, 10 h.p. 28in. blade, 9in. maximum opening. (Two.)

Berry Plate Guillotine, capacity 4ft. × 1in. 18in. throat, 30 h.p. motor.

New 1-cwt. and 2-cwt. Hammers by Massey and Alldays & Onions, also 3-5-cwt. secondhand E.O.T. Cranes.

30 Ton Marshall Fleming, 29ft. span, cab control.

25 Ton Clyde, 21ft. 9in. span, cab control 1954. Can convert any span to 95ft.

20 Ton Vaughan 42ft. 3in. span. Unused.

20 Ton Morris Goliath, 35ft. span, 5 ton auxiliary.

10 Ton Heywood, 34ft. span. Unused.

10 Ton Morris, 32ft. 10in. span, cab control.

10 Ton, 60ft. span. 1955. (Two.)

5 Ton, 37ft. span. 1944.

3 Ton Morris, 149ft. span. 1954.

FRED WATKINS (ENGINEERING), LTD., Coleford, Glos. 'Phone: Coleford 2271 (5 lines).

AUTOS
CONOMATIC 1¼in. 8-spindle Type W.W.

BORERS
RICHARDS Horizontal Borer 2A, with facing head.
JUNGENTHAL Vertical Borer. Chuck diameter 39in., maximum swing 46½in.

DRILLING
ASQUITH 4ft. O.D.1 Radial Drill.
PROGRESS 5E Round Table.
ARCHDALE 28in. Heavy Duty Pillar Drill

GEAR SHAPING
MODEL 61 **FELLOWS** Gear Shaper. Straight spur 35in. dia. × 5in. face width.

LATHES
WARNER & SWASEY No. 2A Long Bed.
SOUTHBEND 16in.
EDGWICK 7in.
DEAN, SMITH & GRACE. Height of centres 7in.
MONARCH 22M S.S. Taper Turning Lathe.
WARD 10 Combination Turret Lathe.
WARD 2A.
WARD 3A. with Ball Chuck and Bar Feed.
HERBERT 4 with Flamard bed, draw back chuck and Bar Feed.

MILLING
28in. **ARCHDALE**, Rapid all ways.
18in. **EDGWICK** Production Mill.
CINCINNATI No. 5 High Power Plain Hor. 1942 Machine.
CINCINNATI No. 4 Vertical High speed, power down.
CINCINNATI No 3 Vertical medium speed, power down.
MILWAUKEE 2H Vertical—rebuilt.
MILWAUKEE 2HL Vertical—rebuilt.
MILWAUKEE 2K Plain—overhauled.
MILWAUKEE 3KM Universal, metric, with dividing head.
PEGARD Bed Type Vertical, table 84in. × 29in.—slightly used.

SHEETMETAL GUILLOTINES
EDWARDS 6ft. × 1/16in. Overcrank.
"**ELDAIR**" NEW PRESS BRAKES.
6ft. × 12g. between column. Delivery 10 weeks.
6ft. × 3/16in. between column. Delivery 3 weeks.
10ft. × 1/16in. between column. Delivery 1 week.
All machines motorised 400/3/50.

STANCROFT LTD.,
BEDWORTH ROAD, COVENTRY
Telephone Coventry 88072/3.

SHEET METAL MACHINERY, MACHINE TOOLS, PRESSES, PLASTICS AND WOODWORKING MACHINES.

New and used — many of each EX STOCK — for cash or monthly account, hire purchase or by the F J E Machine Hire Plan.
May we tell you more ?

F.J. Edwards Ltd

EDWARDS HOUSE,
359-361 EUSTON RD., LONDON, N.W.1
Phone: EUSton 5000 Telex 24264
and Lansdowne House
41 Water St., Birmingham 3
CENtral 7606-8

THE SPOT ● TO WATCH!

FOR GOOD CLASS SECONDHAND MACHINES AT LOW COST

B.S.A. No. 48 Automatic.
BROWN & SHARPE '00' Automatic.
HERBERT 4BS Capstan.
WARNER & SWASEY No. 2 Capstan.
JONES & SHIPMAN 4 Spindle Drill.
HERBERT 4 Spindle Drill.
CORONA 2 Spindle Drill.
LANDIS 4in. by 18in. Plain Grinder.
B.S.A. No. 7 Centreless Grinder.
SCRIVENER ICA Centreless Grinder.
PRECIMAX 6in. by 12in. Plain Grinder.
NEWALL Thread Grinder 8in. by 36in.
MYFORD M.G.9 Uni. Grinder.
ESSEX Centreless Grinder.
ABWOOD Surface Grinder. Vert. Sp.
BROWN & SHARPE No. 11 Grinder.
LEBLOND No. 15 R.P. Lathe.
HOGARTH S.S. Lathe.
D.S. & G. 13Z Lathe.
HERBERT ND Lathe.
SOUTHBEND 10in. Lathe.
ADCOCK & SHIPLEY No. 3 Hor. Mill.
MILWAUKEE Simplex 12/24 Mill.
CINCINNATI Model 08 Vertical Mill.
MILWAUKEE 4H Uni. Mill.
MILWAUKEE 2HL Hor. Mill.
CLEVELAND Vertical Mill.
ARCHDALE 18in. Vertical Mill.
REED PRENTICE 3VG Vert. Mill.
KELLER 1210 Diesinking Machine.
KITCHEN & WADE No. 2 Honing Machine.
SENTINEL 25T Power Press.
ORMEROD 4in. Slotter.

LATE AMERICAN MACHINES

GLEASON 3in. Str. Bevel Gear Generator.
GLEASON 12in. Str. Bevel Gear Generator.
FELLOWS 7125 High Speed Gear Shaper.
FELLOWS No. 7 High Speed Gear Shaper.
FELLOWS 61A High Speed Gear Shaper.
HEALD 72A3 Internal Grinder.
GLEASON No. 16 Spiral Bevel Hypoid Gear Generator.

All machines motorised 400/3/50 unless otherwise stated.

GOOD USED MACHINE TOOLS WANTED

E. H. JONES MACHINE TOOLS LTD.
48 HIGH STREET, EDGWARE, MIDDX.
PHONE EDGWARE 4488/9
78, WRENTHAM STREET, BIRMINGHAM 5, *Phone Midland 5593*

ALBERT EDWARDS (MACHINERY) LTD.,

79/80, PENTONVILLE ROAD, LONDON, N.1
Telephone TERMINUS 0167/8/9

BLACKBURN & CRAWSHAW 8ft. × ¼in. Geared Power Guillotine.
TAYLOR & CHALLEN 370, 20 ton Power. Press. Geared 4in. stroke. M/D 400/3/50.
FELS A83 Nibbling Shear, ¼in. capacity. 50in. throat.
TAYLOR & CHALLEN 562, 100 ton Power Press. Double sided. Adjustable stroke M/D 400/3/50.
EAGLE 7ft. × 12g. Hand Geared Folding Machine.

LEONARD ROTH

ABBOT ST., KINGSLAND HIGH ST., DALSTON JUNCTION, LONDON, E.8.
TERMS ARRANGED
Tel. CLIssold 0513/4

8ft. 16 gauge Hand Folding and Bending Machine. £200.
6ft. by 3/16th Heavy Duty Power Folding and Bending Machine with 400/3/50 motor. £175.
EDWARDS 36in. 16 Gauge Cramp Folder £45.
EDWARDS 48in. 14 Gauge Power Guillotine, 400/3/50. £250.
36in. 18 Gauge Production Guillotine, continuous operation, 400/3/50. £85.
EDWARDS 42in. 18 Gauge Treadle Guillotine. £47 10s. 0d.
36in. ditto. £36.
30in. ditto. £30.

PLEASE WRITE FOR LISTS

HIGH QUALITY USED MACHINE TOOLS

ARCHDALE 20in. Milling Machine, table size 40in. × 10in., power and rapid traverses to table, reversing spindle, backlash eliminator. 400/3/50.
COVMAC 13in. Swing Gap Bed Lathe, by 6ft. 3in. b.c. 400/3/50.
DENHAM 6in. Gap Bed Lathe by 2ft. 3in. b.c. 400/3/50.
BARDONS & OLIVER No. 3 Universal Turret Lathe. 400/3/50.
WARNER & SWASEY 1A Turret Lathe. 400/3/50.
KELLY 28in. Stroke Heavy Duty Shaping Machine with swivelling table. 400/3/50.
RUSSELL Saw Sharpening Machine, max. capacity 42in. diameter. 400/3/50.
ORMEROD 12in. Slotting Machine. 400/3/50.

WE UNDERTAKE REBUILDING OF ALL TYPES OF MACHINE TOOLS

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL, BIRMINGHAM, 18
Tel. EDGbaston 1118 & 1119. 'Grams: Capstan, Birmingham.

Victory Copying Machine, 45in. For blue and dye line prints. With developing unit.—WILCOX & CO., Barr Street, Birmingham 19. NORthern 1234/5.

One Wadkin High Speed Vert. Milling Machine, powered by B.T.H. 4 h.p. electric motor, 440/3/50. Table size 5ft. 6in. × 1ft. 1in.—THOS. COSGROVE, 29/33, Kincardine Street, Dundee. 'Phone 23945.

ELLIOTT INVITES YOU

to see the range of

FINE MACHINE TOOLS *at*

B. ELLIOTT (MACHINERY) LTD
VICTORIA WORKS, LONDON, N.W.10
Tel. ELGAR 4050

ACBARS

AVAILABLE FROM STOCK

AUTOMATICS
RYDERMATIC No. 12 Vertical Multi-Tool Lathe.

BROACH
FORST RIAS Universal Vertical Broach for internal and surface broaching. 5 tons, 39½in. stroke. 1952 machine.

GRINDERS
SNOW vertical spindle, rotary table 10in. dia. cup wheel, 24in. dia. elec. chuck.
BROWN & SHARPE No. 2 Surface.
New ALPA Surface, 32 × 8in.
JUNG AS Internal.
KEIGHLEY Type XL Hydraulic Plain Grinder, 6in. × 18in.
CHURCHILL 10in. × 24in. Universal.
LANDIS 12 × 48 Universal.
BROWN & SHARPE No. 3 Universal.
NORTON 14in. × 36in. Universal.

CAPSTAN AND TURRET LATHES
LEICHTI PR Turret Lathe (Swiss).
GISHOLT Turret Lathes.
FOSTER No. 2B Turret Lathe.

CENTRE LATHES
SMART & BROWN Type M 4in. Precision.
HENDEY 6in. × 30in. Taper Turning.
MONDIALE 7in. × 60in. Gap Bed.
CROMWELL 3½in. Precision.

MILLERS
WERNER No. 5160 Small Multipurpose. Vert. and Horiz. Table 22in. × 6¼in.
ARCHDALE 14in. Manufacturing type.
CINCINNATI Type OK 18in. Horiz.
EDGWICK 18in. Horizontal.
ARCHDALE 20in. Twin Overarm Horizontal. Table 40in. × 10in.
KENT-OWENS 1-8 and 1-14 Hydraulic Production.
New TAYLOR Vertical, table 17½in. × 5½in.
HERBERT 23V Vert. Table 68in. × 17in. 48in. traverse.
HELLER Automatic Thread Millers (4).
ASQUITH HKO Duplex Keyseater.

PRESS
V. & O. No. 11 Double Action. Approx. 10 tons. Roll feed. Max. draw 1in.

All machines motorised 400/3/50 unless otherwise stated.

ACBARS LIMITED,
331-3, WALWORTH ROAD, LONDON, S.E.17.
Telephone: RODney 7822.
Telegrams: Acbrb London S.E.17.

Classified Advertisements (*PLANT FOR SALE, contd.*)

NEWALL
USED MACHINE
DIVISION

HAVE AVAILABLE FOR EARLY DELIVERY

NEWALL / KEIGHLEY 'L' 12 by 24 External Grinder, complete with built in Wheel Dressing Compensating Valve.

MILWAUKEE Vertical Milling Machine, Model 'H' 5ft. 3in. by 1ft. 3in.

HEALD 72A Internal Grinder.

NEWALL 836 Thread Grinder.

NEWALL 10-U Lapping Machine.

No. 16 BLANCHARD Surface Grinder.

All ex used stock

THE
NEWALL
USED MACHINE DIVISION
OUNDLE ROAD
ORTON LONGUEVILLE
PETERBOROUGH

Telephone: Peterborough 67116/7

Edgwick Vertical Surface Broacher. Slide 60in. × 12in. Table 14in. × 14in. Motorised.—WILCOX & CO., Barr Street, Birmingham, 19. Northern 1234/5.

For Sale. One "Britannia" Ideal Boiler type 39KO, fired by Nu-Way XL6 burner. Fitted with automatic electric timing control and mono accelerating pump. The boiler feeds eight Univector unit fan heaters Model No. 15LS-185505, circulating, 1,020 c.f.m. at a temperature of 50 to 125 deg. F. and providing 61,800 B.Th.U. per hour each.—Apply THE MANGANESE BRONZE & BRASS CO., LTD., Beverley.

NEW & USED MACHINE TOOLS AND EQUIPMENT

Now available
HORIZONTAL TAPPING MACHINES
Capacities 3/16in. ⅜in. ½in.

WILKINSON
MACHINE TOOLS CO
5, VILLAGE WAY,
PINNER, MIDDLESEX.
Telephone: FIELD END 6529.

HELIOT
35 GREENWICH CHURCH ST,
LONDON. S.E.10 GRE.1222

CAPSTAN LATHES

WARD No. 7 Chucking, covered bed.

TURRET LATHES

WARD No. 7, covered bed, collet head and bar feed.

WARD No. 16, covered bed, 8½in. spindle, 32in. 4-jaw chuck, rapid and power feeds to saddle, cross slide and turret, power rotating turret, spindle speeds 7-225 r.p.m., 50 h.p. motor.

WARD No. 10B, covered bed. 4½in. spindle power rotating turret, power and rapid feeds to turret only, collet head and bar feed.

HORIZONTAL MILLERS

CENTEC Model 3R Electronic Control 29in. by 11in. table. Speeds up to 3,000 r.p.m., auto cycle with automatic elevation to head.

SUNSTRAND No. 2 Electro Mill, auto. cycle, 12in. by 54in. table.

HERBERT No. 3ND. Plain.

EDGWICK No. 2, 11in. by 42in. table, No. 40 steep taper.

JONES & SHIPMAN duplex slot miller. Hydraulic feed.

VERTICAL MILLERS

WADKIN high speed for light alloy, 16in. by 40in. table.

GRINDING MACHINES

BROWN & SHARPE No. 2 Surface Grinder, 18in. by 6in.

TAPPING MACHINES

HERBERT No. 2 Flash Tapper, ½in. capacity.

All machines motorised 400/3/50 unless otherwise stated.

New Britain Single Spindle Chucking Auto. Size No. 38, 10in. dia. swing. Motorised.—WILCOX & CO., Barr Street, Birmingham, 19. Northern 1234/5.

HEX HEADED BOLTS
R. Quality and B.M.S.
Delivery ex-stock
Lists available

WM. HURLOCK JNR. LTD. (Estab. 1904)
5-7 Kingston Hill, Kingston-on-Thames
Surrey. KIN 4526-7-8

GORTON 9J Copy Miller, 1942.
NEW BRITAIN GRIDLEY 61 1⅝in. and 2¼in. Six Spindle Autos, Late (4 available).
WICKMAN 1⅝in. 5 Spindle Auto, late, 2 available.
B.S.A. ACME GRIDLEY ⅝in. 4 Spindle Autos., 3 available.
ACME GRIDLEY 2¼in. 4 Spindle Auto.
INDEX OR 12 & 12 SS Autos.
EDGWICK Type A 1611 Diecaster.
SIDNEY 36in. swing × 144 Lathe.
REED PRENTICE 1½ G Diecaster.
GRIDLEY Type L 5in. Auto.
LE BLOND No. 2 Deep Hole Drill.
ELECTRAULIC VBH, 15 ton Broach.
BLANCHARD 18 Surf. Grinder.
VICTORIA U3 Monotrol-Univ. Miller, 1953.
CONOMATIC 8 sp. 1⅝in. Bar Auto.
BROWN & WARD ⅝in. and 1¼in. Autos.
WARD 3A Capstans.
HERBERT 4 Senior Capstan.
CLEVELAND 1 1/16in., 1⅝in., 2in., 2⅝in., 3⅝in. Autos.
MASSEY 5 cwt. Press Hammer, 1942.
Three **UNION** ⅝in. Pedestal Drills. NEW.
BULLARD 16in. 6-sp. Mult-au-Matic, 1943.
GLEASON 12in. Bevel Gear Generator.
FELLOWS 61A, 645A Gear Shapers.
BRYANT 16-38 Internal Grinder.
HEENAN-FROUDE Baling Press, 1947.
SCHULER Vertical Dieing Press.
HERBERT 98 Turret Lathe.
MILWAUKEE 2H Plain Miller.
BLISS 304A 50 ton Press, 4in. stroke.
NORTON 14 × 72 Univ. Grinder.
BROWN & SHARPE No. 3 Univ. Grinder.
DEFIANCE 25A Horizontal Borer.
ARCHDALE 38in. Sens. Radial Drill.
NEWALL type L 10in. × 48in. Grinder, 1942
HEALD 72A Internal Grinders (3).
NORTON 12 × 36 Universal Grinder.
WARNER & SWASEY 3, 5 and 2A Turrets.
PRATT-WHITNEY 12B 2-sp. Profiler, 1941.
EDGWICK No. 2 Universal Miller.
CHURCHILL No. 1 Planetary Grinder.
ORCUTT HM24 Gear Grinder, 1944.
GISHOLT 5 and 1L Turret Lathes, 1941-43.
GRIDLEY Model R, 2⅝in. cap. 4-sp. Auto.
ARCHDALE 18in. and 30in. Vert. Mill, 1942.
MONARCH Copying Lathe, 1946.
CHURCHILL PBH 12 × 36 Univ. Grinders.

All modern fully motorised machines.

HUNDREDS MORE

J. B. MACHINE TOOL CO., LTD.,
312/4, BRADFORD STREET,
BIRMINGHAM, 5.
Tel.: MIDLAND 4375.
AND AT WOLVERHAMPTON

18in. 'Rapidor - Manchester' Hacksaw, 3 h.p. Motor, Geared Suds Pump and Vice. Further details from:
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.
Member of B.A.M.T.M.

Churchill Model AC. Hydraulic Internal Grinding Machine. Max. swing 24in. Max. traverse of wheelhead 29in. Admits work 60in. Post-war machine.—LEE & HUNT LTD., Crocus Street, Nottingham. 'Phone: 84246.

FORREST

RHODES 6ft. 0in. × ¼in. Guillotine.
BENNIE 4ft. 0in. × ¼in. Bending Rolls.
LANG 22in. Boring and Facing Lathe.
ORMEROD 36in. Shaper.
REDMAN 10ft. × 4ft. × 3ft. Planer, Lancs. drive.
RICHARDS No. 1 and 2 Horiz. Borers.
DENHAM 11in. × 6ft. 6in. S.S. & S.C. Lathe.

W. FORREST & CO. LTD.,
SYLVESTER GARDENS,
SHEFFIELD, 1.
'Phone: 23314/5.

Classified Advertisements (*PLANT FOR SALE, contd.*)

R. O. GRAY

WARD 2A Capstan Lathe equipped ball chuck and bar feed.

TWO **WARD** 3A Capstan Lathes. Both equipped ball chuck and bar feed.

DRUMMOND Model K Capstan Lathe, arranged for chucking. $2\frac{1}{16}$in. Hollow spindle.

HERBERT No. 7 Junior Combination Turret Lathe. Flamard bed.

ONE **HERBERT** 2B Capstan Lathe, arranged for chucking.

HERBERT 1S Capstan Lathe, part bar feed.

TWO **MOREY** 2G Capstan Lathes, arranged for chucking.

HERBERT $1\frac{1}{4}$in. Single Spindle Bar Automatic, with equipment.

DEAN, SMITH & GRACE, A.N. Type, 7in. by 4ft. between centres S.S. & S.C. Gap Bed Lathe. 2in. H.S. Swing in gap $24\frac{1}{4}$in. by $7\frac{1}{8}$in.

CARSTENS $4\frac{1}{2}$in. by 20in. between centres S.S. & S.C. High Speed Precision Lathe, fully equipped with collets, chucks, etc.

CHURCHILL-CUB 5in. by 20in. between centres S.S. & S.C. Lathe, with chucks, pick-off gears.

KEARNS No. 2 Horizontal Boring and Facing Machine, with Vernier Height Gauge and Boring Bars.

KEARNS No. O.A. Production type Horizontal Boring Machine with 2in. dia. traversing spindle.

KITCHEN & WADE Heavy Duty Pillar Drill. Spindle bored No. 4 M.T. Rise and fall table 24in. dia., swings round column.

ARCHDALE Two-Spindle Relieving Drill, No. 1 M.T. Power feed and independent motor drive to each spindle. Table W.S. 36in. by 15in.

HAHN & KOLB Two-Spindle Drilling Machine. Power feed and independent motor drive to each spindle, fitted $\frac{3}{4}$in. drill chuck. Table W.S. $21\frac{1}{2}$in. by 9in.

DISKUS Vertical Spindle Surface Grinder, hydraulic feeds. Table 53in. by 10in. 14in. dia. segmental wheel.

CHURCHILL Model "O" Universal Tool and Cutter Grinder, capacity 8in. by 16in.

EDGWICK No. 1 Keyseating Machine.

DAVID BROWN Worm Shaft Milling Machine, 4in. centres by 33in. between centres.

BROWN & SHARPE No. 2 Universal Milling Machine. Table W.S. 46in. by 10in. Spindle speeds 30-1,300 r.p.m. With high speed Vertical Milling Attachment, Slotting Attachment, Universal Dividing Head, chuck, change gears, rotary table, etc.

THREE **HERBERT** O.V. Vertical Milling Machines, swivel head. Table W.S. 18in. by 5in. Spindle speeds 250-2,000 r.p.m.

TRIDENT V.O. Swivel Head Vertical Milling Machine. Table W.S. 30in. by 8in. Spindle speeds 130-800 r.p.m.

ARCHDALE 20in. Plain Horizontal Milling Machine. Table W.S. 10in. by 31in. Dial change.

EDGWICK 18in. Plain Horizontal Milling Machine. Table W.S. 26in. by 7in. Spindle speeds 30-600 r.p.m.

ASQUITH Two Spindle Profile Milling Machine. Capacity 24in. by 28in. Spindle speeds 250 to 3,000 r.p.m.

WOTAN 16in. Crank Shaping Machine.

ALBA 18in. Crank Shaping Machine.

THIEL No. 6 Radial Arm Tapping Machine, capacity $\frac{3}{4}$in. Whit.

JONES & SHIPMAN "Electrotap", with quantity of leaders.

SIX **TURNER** Spin Rivetting Machines, type R.S.5.

CANNING Centreless Polishing Machine, with motorised dust extractor.

EDWARDS 4ft. by 14g Power Guillotine.

TAYLOR & CHALLEN 10 Ton Inclinable Blanking Press, $\frac{1}{2}$in. stroke.

PFAUTER R.S.1. type Vertical Gear Hobber.

PFAUTER R.S.11 Horizontal Gear Hobber.

All machines self-contained drive. 400/440 volts, 3 phase, 50 cycles.

R. O. Gray.

4/6 MINERVA ROAD, PARK ROYAL, LONDON, N.W.10

Telephone: ELGar 4841/4842

Classified Advertisements (PLANT FOR SALE, contd.)

NORTON FOR NEARLY NEW **MACHINE TOOLS**

Ring TATE GALLERY 0633/6

For Complete Stock List.
REVERSE CHARGE CALLS ACCEPTED

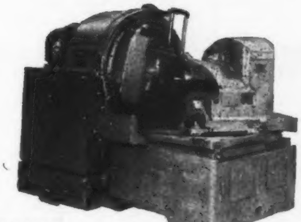
A selection of New and Nearly New machines from Stock

AUTOMATICS
CONOMATIC (U.S.A. built) 4 sp. 4⅜in.
GREENLEE 6 sp. 1⅝in.
ACME GRIDLEY (U.S.A. built) 4 sp. 1⅜in.
CONOMATIC 6 sp. 1¼in.
B.S.A. GRIDLEY 4 sp. ⅞in.
GRIDLEY 6 sp. 9/16in. Choice of two.
BROWN & SHARPE 2G. 1in. Cap.
BROWN & SHARPE OG. ⅜in. Cap.
B.S.A. No. 38. ½in. Cap.

BORERS
CRAVEN 36in. dia. table, heavy duty vertical Borer, with side head, elevating cross rail, rapid feeds.
PEARN RICHARDS No. 3 Horizontal.
RICHARDS HBF.1 Horizontal Borer, 2½in. travelling spindle, facing head.
NEWALL No. 0 Jig Borer, rebuilt by makers.

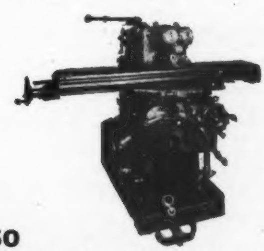
GRINDERS
CHURCHILL 12in. by 50in. Hydr. Universal, internal spindle.
JONES & SHIPMAN 8in. by 16in. Universal, internal spindle.
JONES & SHIPMAN 8in. by 24in. Model 1014 Universal Toolroom. Well equipped.
JONES & SHIPMAN 18in. by 6in. Model 540H Surface Grinder, with dust extractor.
CHURCHILL 20in. by 96in. Hyd. Cylindrical Serial 20468. For delivery August.
KAESAR 10in. by 40in. Plain Cylindrical (UNUSED).
MYFORD 5in. by 9in. MG9 Cylindrical.
CHURCHILL 42in. swing 120in. bore internal.
HEALD No. 81 Internal Gagematic Automatic Chuck Grinder. Serial 18601.
HEALD Model 81 Internal Plain.

MILLING MACHINES
VICTORIA U.3 Universal, Table 60in. by 12¼in.; 22 to 1,020 rpm. NEW.
MILWAUKEE 3H Plain, table 64in. by 13½in.; 20 to 1,000 rpm.
ARCHDALE 20in. Plain Rapid Production.
CINCINNATI 08 Production (Choice of two).
CINCINNATI No. 3, Vertical Dial Type, table 62½in. by 15¼in.; 18 to 450 rpm.



£5,950
GLEASON 24 Straight Bevel Gear Generator. Serial No. 17920.

£2,750
LUMSDEN 24in. dia. Retractable Rotary Table Surface Grinder Model 90RT. With Chuck.



£1,850
MILWAUKEE 3H Plain Horizontal table 64in. by 13½in. Speeds 20 to 1,000 r.p.m.

W. E. NORTON (MACHINE TOOLS) LIMITED
GROSVENOR GARDENS HOUSE · GROSVENOR GARDENS · LONDON · S·W·1
Telephone: TATe Gallery 0633/4/5/6 *Cables:* Norbros, London

Classified Advertisements *PLANT FOR SALE, contd.)*

RING BELLS *for machine tools*

LEEDS 63-7398

ARCHDALE 20in. Horizontal Miller. Twin round overarms. Table 40in. by 10in. With 22in. long. traverse. Speeds 30–617 r.p.m. by dial M.D. 400/3/50.

TAREX 52 mm. Single Spindle Auto. Built 1952. Max. capacity $2\frac{1}{16}$in. 16 speeds 117–1,854 r.p.m. With bar feed and large quantity of equipment. M.D. 400/3/50.

REED PRENTICE No. 5 Vertical Miller. Kneeless type. Table 68in. by 16in. With long. power traverse 16in. also Q.P.T. 18 speeds 17–600 r.p.m. With 20in. Power operated circular table.

WARD 2A Capstan with Taper Turning. Swing over bed 11½in.; over cross slide 6¼in. A.G.H. 12 speeds 48–2,041 r.p.m. Spindle bore 1⅜in. Quantity of equipment. M.D. 400/3/50.

ARCHDALE 24in. Swivel Head Vertical Miller. Table 40½in. by 14in. Long. power traverse 24in. Geared head gives 12 speeds 45–812 r.p.m. M.D. 400/3/50.

KEARNS OA Horizontal Borer. Travelling spindle 2¼in. dia. Facing head 14in. dia. With verniers. M.D. 400/3/50.

HEIDENREICH & HARBECK Model 15 K.H.G. Bevel Gear Generator. Built 1952. Max. pitch 5⅝in. M.D. 400/3/50.

ASQUITH U.G.D. Vertical Drill. Date 1955. Spindle No. 5 M.T. 12 speeds 31–830 r.p.m. F. & R. Quick acting compound table 30in. by 10½in. M.D. 400-440/3/50.

CHURCHILL H.B.A. Internal Grinder. Swings inside water guards 12in. M.D. 400/3/50.

FROST 8ft. by ¼in. Cramp Folding Machine. Length of blade 96½in. Top beam lifts 7in. by 2 H.P. motor. Top beam swings out for work removal. Drive by 7 H.P. motor through gearing. M.D. 400/3/50.

SNOW Vertical Spindle Surface Grinder. Hydraulic table traverse up to 64in. 12in. segmental wheel. With 10in. by 54in. magnetic chuck. M.D. 415/3/50.

CHURCHILL No. 1 Planetary Grinder. Cap. with largest spindle 10in. dia. by 18in. long. M.D. 400/3/50.

HUNT 1A Twist Drill Grinders. Cap. ¼in.-1in. M.D. 400/3/50.

MASSEY 5 cwt. Clear Space Pneumatic Hammer. 141 blows per min. 25 h.p. motor 400/3/50.

GISHOLT No. 4 Bar Feed Capstan. Swing over hardened strip bed 18½in.; over cross slide 9⅜in. Spindle bore $2\frac{3}{16}$in.; collet cap. 2in. 12 speeds 28–730 r.p.m. M.D. 400/3/50.

MONARCH 18in. by 48in. S.S. & S.C. Lathe. Flamard bed. Taper turning. M.D. 400/3/50.

HERBERT No. 9 Combination Turret Lathe. 16 speeds 14-400 r.p.m. Spindle bore 3⅜ins Power feeds all ways also quick power traverse to turret. With 14in. 3-jaw chuck and suds pump. M.D. 415/3/50.

MILWAUKEE 1H Horizontal Miller. Table 40in. by 9in. overall. Long. traverse 22in. Quick power traverses all ways. 16 speeds 35–1,400 r.p.m. M.D. 400/3/50.

H. BELL (Machine Tools) LTD., Walter Street, LEEDS 4.

Mitchell 8½in. S.S. & S.C. Gap Bed A.G.H. Lathe with 3in. Hollow Spindle. Speed range 30-400 r.p.m. Further details from:

C. & G. OLDFIELD, LTD.
15, Abercorn Street,
PAISLEY.

Member of B.A.M.T.M.

DIMCO

No. 3 **GISHOLT** Bar Feed Capstan Lathe with equipment.
No. 2 **WARNER & SWASEY** Capstan Lathe. Chucking.
2D **HERBERT** Bar Feed Capstan.
No. 3 **GISHOLT** Chucking Capstan.
43in. × 12in. **FITZ WERNER** Vertical Miller. Swivelling head.
U3 **VICTORIA** Universal Milling Machine with Vertical and Slotting attachments. 8 years old.
20in. **ARCHDALE** Plain Miller. Power feeds and rapids. Spindle speeds 60-1,230 r.p.m.
20in. **ARCHDALE** Plain Miller. Power feeds and rapids. Spindle speeds 30-615 r.p.m.
No. 3 **KITCHEN & WADE** Honer.
No. 2 **KITCHEN & WADE** Honer.
11in./16in. **NOBLE & LUND** Hydraulic Cold saw with Hydraulic clamp.
Model **HBY CHURCHILL** Electrical Grinder.
14in. **BUTLER** Slotter. Power revolving table.
8in. **FABIUS** S.S. & S.C. Lathe. 5ft. between centres. As new.
No. 3 **RICHARDS** Horizontal Borer Model PRT3.
No. 3 **KEARNS** Horizontal Borer.
No. 2 **KEARNS** Horizontal Borer.
8in. **REED PRENTICE** Lathe 6ft. 6in. between centres.
16in. **CRAVEN** Lathe 20ft. between centres.
54in. × 15in. **CRAVEN** Universal Milling Machine.
HERBERT S.E. Capstan Lathe.
24in. **ORCUTT** Automatic Gear Grinder (New).
4A **LIBBY** Turret Lathe.
CRAVEN Worm Milling Machine.

DIMCO (Gt. Britain) LTD.
28, Wood Lane,
SHEPHERDS BUSH,
LONDON, W.12.

SHEpherds Bush 4401/2.

MARTIN

EMPRESS WORKS, EMPRESS STREET
CORNBROOK, MANCHESTER, 16

Tel.: Trafford Park 1091-2

USED MACHINES IN STOCK

WARNER & SWASEY 1a Turret Lathe.
POLLARD 3 Spindle No. 3 M.T. Drill.
CHURCHILL No. O 6in. × 18in. Universal Grinder.
HUNT No. 3 Twist Drill Grinder.
WARD HAGGAS SMITH 24in. Surfacing and Boring Lathe.
ARCHDALE 28in. Manufacturing Miller.
RACCINE 6in. Hacksaw.

GUARANTEED REBUILDS

We will rebuild your own machine tools back to maker's specification with 6 months' guarantee.

NEW MACHINE TOOLS IN STOCK OR ON SHORT DELIVERY

H.M.V. Horizontal Borer, Type A.V. 75, 3in. Travel Spindle.
GRIMSTON 6in. and 7in. Double Ended Grinder.
J. MITCHELL 8½in. × 4ft. 6in. "M.A.G." Lathe.
WORCESTER 6 ton Crank Press.
QUALTERS & SMITH 10b Band Saw.
TOWN 4ft. 6in. Radial Drill, type A.E.4.

TOOLS FOR SALE EX-SITE

BUFFALO 28U Double Ended Punch, Shear and Angle Cropper.
ASQUITH 6ft. Radial Drill with screw cutting attachment.

MACHINES MOTORISED 400/3/50 UNLESS OTHERWISE STATED

The above list is only a selection; please call or write for our priced brochure.

Edwards Power Folder 8ft. × ¼in. Almost New.

Further details from:—
C. & G. OLDFIELD, LTD.
15, Abercorn Street
PAISLEY.

No. 4 Richards PRN Standard M/D All-geared Hor. Boring and Facing Machine, with balanced head and covered ways. Arranged for screwcutting. Will face up to 48in. dia. Drive by 20 h.p. 400/3/50 motor. 24 spindle speeds 1.65-162 r.p.m. Main table 60in. × 36in. Quartering table 36in. × 36in. Max. distance facing head to outer steady 9ft. 6in.—LEE & HUNT, LTD., Crocus Street, Nottingham. 'Phone 84246.

NEW MACHINES FOR IMMEDIATE DELIVERY

MANNAIONI 4Y-700 High Speed single point Threading machine. Centre height 6¼in. x 28in.

WMW SI.125 × 175 Internal Grinding Machine. Capacity 1in.-5in. diameter.

MAS Model SP25E Semi-automatic copying lathe with programme control, 2 copying slides, swing $9\frac{11}{16}$in. x 25in.

GUISTINA Model R1.900 Heavy Duty Surface Grinder, with 36in. dia. Rotary table.

LEINEN Model DM3SE High Speed Thread Chasing Lathe. Centre height 4in. by 12½in.

ELGAR MACHINE TOOL CO. LTD.
172-178 VICTORIA ROAD, ACTON,
LONDON, W.3.
Telephone: ACOrn 5555 (7 lines)

Classified Advertisements (*PLANT FOR SALE, contd.*)

Classified Advertisements (*PLANT FOR SALE, contd.*)

DOUGLAS
OF HIGH WYCOMBE

SECONDHAND MACHINES FOR IMMEDIATE DELIVERY

LATHES AND CAPSTANS

CHALLENGER S & S.C., 5in. Centre Lathe. £80
HERBERT SMALLPIECE No. 9WSL Multi-cut Production Lathe. £345
LANG 7in. High Speed Finishing Lathe. £450
MYFORD DRUMMOND 3½in. Centre Lathe. £35
SMART & BROWN 4in. Centre Lathe. £110
SOUTHBEND S.S. & S.C. 4½in. Centre Lathe. £120

DRILLING MACHINES

ADCOCK & SHIPLEY Pillar Drill, No. 2 Morse. £65
SMITH & COVENTRY Pillar Drill, No. 2 Morse. £40
HERBERT ½in. cap. High Speed Bench Drill. £35

FOLDING AND BENDING MACHINES

COBURN 6ft. × 18 gauge Folding Machine. £90
BESCO 3½ft. × 18 gauge Folding Machine. £45
HILMOR Tube Bending Machine. £45

GRINDING MACHINES

ABWOOD Surface Grinding Machine (hand feeds), Model TH2AP. £375
CINCINNATI Plain Cylindrical Grinding Machine, 6in. × 24in. cap. £450
EXCEL No. 1 Bench Surface Grinding Machine. £85
JONES & SHIPMAN Universal Cylindrical Grinder, Model 1027. £750

MILLING MACHINES

BEAVER Model A Turret Mill, 28in. × 6in. table. (As New.) £335
CINCINNATI No. 3 Sliding Head Vertical Dial Selection, 63in. × 15in. table. £750
CINCINNATI No. 3 Sliding Head Vertical, 55in. × 13½in. table. £350
DENBIGH C4 Universal Mill, 46in. × 10in. table, 2/1 vertical head. £395
MILWAUKEE No. 2 Horizontal, 50in. × 14in. table. £475
PARKSON 2P Horizontal, 52in. × 12in. table. £550

PRESSES

Fly Press No. 3 **NORTON.** £27
Fly Press No. 4 **VIZOR.** £27 10s.
Double Column Fly Press, screw dia. 2½in. £70
Bench Arbor Press. £12
Double Column Bench Arbor Press. £35

SHAPING AND PLANING MACHINES

INVICTA 6M Stroke Shaper. £500
BUTLER Planer, 9ft. × 2½ft. table. £1,100
EHRENFELD Planing Machine, 13ft. × 3½ft. table. £1,400

THIS LIST DOES NOT INCLUDE THE MANY NEW MACHINES THAT ARE AT PRESENT IN OUR SHOWROOM AT HIGH WYCOMBE. WHY NOT VISIT US TO INSPECT OUR RANGE?

A. DOUGLAS CO., LTD.,
CRESSEX INDUSTRIAL ESTATE, LINCOLN ROAD, HIGH WYCOMBE
BUCKS. Tel.: 4390 (10 lines)

Bryant No. 24-36 Hydraulic Internal Grinder, complete with Hydraulic Wheel Dressing device, Spindle, etc.
Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY

NEW MACHINE TOOLS FROM STOCK

GRANOR OF HALIFAX 28in. stroke Heavy Duty Shaping Machine. 400-440/3/50.

EARLY DELIVERY

MITCHELL OF KEIGHLEY 8½in. Type DM8 Gap Bed Lathe, by 5ft. 3in. B C. 400-440/3/50. Instant delivery.
MITCHELL OF KEIGHLEY 10½in. Type DM10 Gap Bed Lathe by 5ft. 5in. B.C. 400-440/3/50. Instant delivery.
MITCHELL OF KEIGHLEY 12½in. Type DM12 Gap Bed Lathe by 6ft. 9in. B.C. 400-440/3/50. April delivery.
VICTORIA No. 2 Rapidmil Universal Milling Machine. Table size 48in. × 11¾in. 400-440/3/50. Instant delivery.
VICTORIA No. V2 Vertical Milling Machine. Table size 45in. × 11in. 400-440/3/50. Instant delivery.

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL,
BIRMINGHAM, 18

Tel. EDGbaston 1118 & 1119. 'Grams Capstan, Birmingham

Reed Prentice No. 5 Vertical Milling Machine. Table 68in. × 16in. 18 Spindle Speeds 17-600 r.p.m. Excellent condition. Further details from —
C. & G. OLDFIELD, LTD.
15, Abercorn Street,
PAISLEY.

Ward 1in. Capacity Bar Capstan Lathes with Sadi Drives, electric coolant supply.—H. BYWATER, New Spring Street, Birmingham, 18. Cen. 5795.

1¼in. Capacity Capstan. Power feed to turret, excellent condition, can be seen working. Four way tool post, suds pump, bar feed. Price £195.—Telephone: Watford 28916.

Corona Heavy Duty Vertical Drilling machine. No. 5 Morse Taper Excellent condition.
Further details from —
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

Shapers, 20in. × 24in. Stroke, 400/3/50, £275 each.—A. McNAMARA & CO., LTD., New Line, Bacup, Lancs. 'Phone Bacup 946.

C.V.A. No. 12 Automatic, 400/3/50, equipment, B.S.A. 48 similar, first class condition, also B.S.A., ⅝in., and C.V.A. No. 8.—C. L. THOMAS, LTD., Stirling Road, Solihull. Tel. 3075-6.

Lang 20in. Surfacing and Boring Lathe, Chuck Model. Excellent Machine.
Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 8 spindle.
BULLARD Multi-Au-Matic 12in. 6 spindle

BORING MACHINES

KEARNS Model OB Horizontal Boring and Facing Machine, 2⅜in. diameter travelling spindle (1957).
UNION Model BFT100 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle (1955).
KEARNS Model OC Horizontal Boring Machine, 3in. dia. travelling spindle.
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle.
WEBSTER & BENNETT Vertical Boring Machine, table 50in. diameter.
RICHARDS Type PRT Horizontal Floor Boring Machine, 3½in. travelling spindle, 28in. diameter facing head.

CAPSTAN AND CENTRE LATHES

CHURCHILL-REDMAN Model 13NM Heavy-Duty S.S. & S.C. Gap Bed Centre Lathe, 13in. centre height × 72in. between centres. Swing in gap 50in.
MITCHELL Model DM10 S.S. & S.C. Gap Bed Centre Lathe, 10½in. centre height × 7ft. 5in. between centres. (NEW.)
OLDFIELD & SCHOFIELD Surfacing and Boring Lathe, 10½in. centre height.
WARD 7B Combination Turret Lathe.
NILES Heavy Duty Centre Lathe, S.S. & S.C., 17in. centre height × 28ft. between centres.
U.L.R.O. Heavy Duty Centre Lathe, 16in. centre height × 30ft. between centres.

DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.
GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

CRAVEN Roll Grinding Machine, capacity 20in. swing × 138in. between centres.
CHURCHILL Model HBY Internal Grinding Machine.
CHURCHILL Plain Cylindrical Grinding Machine, 26in. swing × 84in. between centres (1951).
LANDIS Type C Plain Hydraulic Cylindrical Grinding Machine, 6in. swing × 18in. between centres.
ORCUTT Model HM24 Internal Spur Gear Grinding Machines.
CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing × 72in. between centres.
BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing × 36in. between centres.

MILLING MACHINES

CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 91in. × 22in. (1952).
CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. × 10in.
CINCINNATI No. 1M Vertical Milling Machine.
CINCINNATI No. 4 Dial Type Horizontal Milling Machine.
PRATT & WHITNEY Model BL3620 3-spindle " Keller " Die Sinking Machine.
CENTEC Model 3R Automatic Production Milling Machine, table 25in. × 16in.

MISCELLANEOUS

LANGE & GAILEN 28in. stroke Double Headed Hydraulic Shaping Machine
TAYLOR & CHALLEN Double Sided 50-ton Geared Power Press, 10in. stroke.

NEWMAN INDUSTRIES LIMITED
Machine Tool Division: YATE, BRISTOL
Tel.: Chipping Sodbury 3311. Telex. 44121.
Cables: " Dynamo Yate."
London Office: Terminal House, Grosvenor Gardens, S.W.1. Tel.: Sloane 8206.
Telex. 23289.

Machinery's **SMALL** *advertisements bring* **BIG** *results*

FOR RATES SEE COMMENCEMENT OF CLASSIFIED AD. SECTION INSTRUCTIONS CAN BE ACCEPTED, SPACE PERMITTING, AT THE LONDON OFFICE UP TO WEDNESDAY NIGHT FOR PUBLICATION ON THE FOLLOWING WEDNESDAY.

"MACHINERY," Clifton House, Euston Road, London, N.W.1.
'Phone: EUSton 8441

You are authorised to insert the above for.........insertions. We enclose remittance according to the rates given on page 127.

NAME..

ADDRESS ....

.... 16.8.61

Classified Advertisements (*PLANT FOR SALE, contd.*)

Harry Kirk Eng. Ltd.

can recommend the following modern quality machines from STOCK

AUTOMATICS

WICKMAN 5in. Chucking Automatic.
RYDER Verticalauto, capacity 16in. swing × 8in., 6 spindles.

BORING MACHINES

KEARNS O.B. Horizontal Boring Machine. 2½in. Spindle. Spindle Speeds 15/600 r.p.m. Excellent condition.
RICHARDS 36in. Vertical Boring Mill, complete with side head.
JONES 6in. Spindle Horizontal Borer. Table 17ft. 6in. × 8ft. Spindle travel 48in. Rapid traverse 84in. per min. Motorised 400/3/50. Weight 70 tons.
BULLARD 36in. Vertical Boring Mill.
KITCHEN & WADE Vertical Fine Boring Machine, 14in. stroke. Compound table.

DRILLING MACHINE

ARCHDALE 8-Spindle Hydraulic Vertical Drilling Machine.

GRINDING MACHINES

BROWN & SHARPE No. 2 Surface Grinder 18in. × 6in. table.
KELLER No. R6 Tool and Cutter Grinder.
LUMSDEN D.E. Tool Grinder.
HEALD No. 172 Gap Bed Internal Grinding Machine, maximum diameter of component 36in.

LATHES

N.D. 8in. × 6ft. S.S. & S.C. Lathe. 30in. between centres.
SMALLPIECE Lathe, type 6 WSLMS.
NOBLE & LUND Heavy Duty Centre Lathe. 22in. centre height × 29ft. between centres Max. swing over saddle 33in. dia.
HARVEY Heavy Duty Centre Lathe. 42½in. centre height × 52ft. between centres Max. swing over saddle 65in. dia.

MILLING MACHINES

EDGWICK No. 2 Universal Milling Machine' Working surface of table 38in. × 7½in.
BROWN & SHARPE No. 3A Universal Milling Machine with Vertical Head Attachment. Spindle Speeds 30/1,200. Power feed all movements.
COLLET & ENGLEHARDT Keller Type. Die Sinking Machine Model FK f80, capacity 60in. × 30in

PLANING MACHINES

CLEVELAND Openside Planing Machine, capacity 10ft. × 2ft. 6in.
CINCINNATI Planing Machine, capacity 8ft. × 2ft. 6in

MISCELLANEOUS MACHINES

Hydraulic Vertical Internal Honing Machine (manufactured by **PETER WOLTERS**), Capacity 0.2in. to 2in.
RAPIDAN Double Helical Gear Generating Machine, 12in. diameter capacity

Further details from

HARRY KIRK ENGINEERING LTD.,
BRANDON ROAD WORKS, BRANDON ROAD, COVENTRY
'Phone:
WALSGRAVE-ON-SOWE 2253 (6 lines).

New for Immediate Delivery CENTEC Model 2B Precision Milling Machine. Power feed to Table.
Further details from:
C. & G. OLDFIELD, LTD.
15, Abercorn Street,
PAISLEY.

Edwards

SAMUEL PLATT Motorised Friction Board Drop Hammer. Weight of hammer 800 lb. Length of drop 5ft. Width between uprights 14in. Arranged motor drive 380-420/3/50. With Udal Automatic operator's safety guard.

BENNIE Motorised 4-Roll Plate Bending and Straightening Machine. Capacity 4ft. × ½in. Diameter of roller 7½in. Top roller bearing swings out to enable complete cylinders to be withdrawn. Gear box drive. Arranged motor drive 440/3/50.

FROST Power Geared Swing Beam High Lift Universal Folding Machine. Capacity 10ft. × $\frac{3}{16}$in mild steel. Separate motor drive to clamping and folding beams. Lift of top beam 7in. Size of top beam 21in. × 17in. Weight about 6 tons. Motor drive 400-440/3/50.

BRONX Type 910 Motorised 90-ton Press Brake. All steel construction. Motorised for 400-440/3/50 supply. Capacity mild steel 10ft. × 10 s.w.g. Stroke 3in. Ram adjustment 5in. Equipped with two back gauge stops with micrometer adjustment. Die space, stroke down adjustment up, 12in. Weight approx. 11 tons.

UNUSED **DE BERGUE** No. 34A Automatic Geared Multiple Punching Machine. Capacity 7ft. 3in. wide × 31ft. long. Will punch 18 holes $\frac{13}{16}$in. diameter in ¾in. plate, or 16 holes $1\frac{1}{16}$in. diameter in 1in. plate at one stroke. Pressure 425 tons. Weight about 42½ tons.

HOLROYD Motorised Toggle Action Rivet Punching Machine with power lift to table. Capacity ¾in. diameter rivets. Stroke of ram 3½in. Depth of gap 5in. Arranged motor drive 350-400/3/50.

NEW **BESCO** Double Geared Guillotine. Motorised for 400-440/3/50 supply. Capacity 120in. × ¼in. mild steel. Fitted with automatic sheet hold-down and adjustable front, back and side gauges. Weight approx. 110 cwt.
Photographs of the above are available.

VERY FAVOURABLE HIRE OR HIRE PURCHASE TERMS CAN BE OBTAINED

MACHINE TOOLS, NEW AND USED, Of Every Description. Attractive Prices.

F. J. EDWARDS LTD.,
359-361, EUSTON RD., LONDON, N.W.1
Telephone: EUSTON 5000. Telex 24264.
And at Lansdowne House, 41, Water St. Birmingham, 3. *Telephone: Central 7606-8*

Brown & Ward Automatics, 1⅝in. 4-operation with threading spindle. ⅝in. and ⅜in. 4-operation, threading spindles, very late models, ⅝in. 3-op. All in excellent condition.—C. L. THOMAS, LTD., Stirling Road, Solihull. Tel. 3075-6.

Landis 10in. × 24in. Type "C" Universal Grinder. Internal Attachment. New condition.
Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY.

Rhodes 40 Ton Power Press, 400/3/50.—A. MCNAMARA & CO., LTD., New Line, Bacup, Lancs. 'Phone Bacup 946.

Richards No. 2 PRT Horizontal Boring and Facing Machine complete Live Spindle.
Further details from:—
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY

MIDLAND

BENDING ROLLS

RHODES 6ft. × 14 gauge Power Bending Rolls.

CROPPING MACHINES

Double Ended Angle Cropping Machine. Cap. up to 6in. × ⅝in. angles.

DRILLING MACHINES

POLLARD 13in. Pillar Drill, No. 2 Morse Taper. R. & F. Table 11in. × 11in.
AMERICAN 6ft. H/Duty Radial Drill, No. 6 M.T. Older machine, in good condition. 400/3/50. Sep. motor.

FOLDING MACHINES

EDWARDS 6ft. × ⅛in. High Lift Swing Beam Universal Folder.

GRINDING MACHINES

New **NORTON** 10in., 12in., 14in., 16in. and 20in. D/E Tool Grinders.
ABRASIVE No. 34 24in. × 8in Vertical Spindle Surface Grinder.

GUILLOTINES

RUSHWORTH 4ft. × ¼in. O/Crank Guillotine. Little used.

KEYSEATING MACHINES

EDGWICK Keyseater. Stroke 4½in. Table 26in. × 9in.

LATHES

HERBERT No. 4 Capstan. 2½in. H/Spindle. Speeds 511.

MILLING MACHINES

EDGWICK No. 2 Horizontal Miller. Table 46in. × 11in.
MILWAUKEE 3H Vertical Milling Machine.

NIBBLERS

BURFREE 2A Nibbling Machine. Cap. ⅛in. M/S.
W.F. 14 Gauge Nibbler. 59in. throat.

PRESSES

TAYLOR & CHALLEN 370, 20 Ton O/F Press.
TAYLOR & CHALLEN 845 Dial Feed Notching Press. Cap. 6 tons.
TAYLOR & CHALLEN 1455 Dial Feed Notching Press. Cap. 2 tons.
BRADLEY & TURTON No. 3 Flypress.
SWEENEY & BLOCKSIDGE Bench Press. Cap. 3 tons.

SAWING MACHINES

BARSON No. 1 Saw. 1¾in. rounds, 2in. tubes, 1¾in. × ⅜in. flats. 1¾in. × ⅜in. angles.

SCREWING MACHINES

KENDALL & GENT 3in. Screwing Machine. Leadscrew type.

POLISHING MACHINES

3 and 5 h.p. Double Ended Polishing Spindles.

WELDING EQUIPMENT

PRESCOTT 15 kVA Spot Welder.

CRANES

BROADBENT 40 Ton O.E.T. Crane. 10 ton auxiliary lift.

All machines 400/3/50 electrics unless otherwise stated

THE MIDLAND MACHINE TOOL CO.
BRADLEY, BILSTON, STAFFS.
Tel. Bilston 42471/9

PIDGEN BROS. LIMITED

HELMET ROW, OLD STREET, LONDON, E.C.1

Telephone : CLErkenwell 6481

ALL MACHINES MOTORISED FOR 3 PHASE SUPPLY UNLESS OTHERWISE STATED

AUTOS
WICKMAN 10 mm.
GREENLEE 1in. × 6 spindle.
BORERS Horizontal)
KEARNS No. 2.
BROACHING
AMERICAN model H2, stroke 30in.
CAPSTANS
PITTLER type RGII 82.
MURAD $\frac{3}{4}$in.
HERBERT 4B and 4.
CUTTING OFF MACHINES
TAYLOR 10in.
DRILLS
NATCO 24 spindle No. 1 M.T.
CORONA Type 15CX 2 spindle.
HERBERT 2 spindle.
MONMOUTH 4 spindle No. 2 M.T.
ARCHDALE 3ft. Radial No. 3 M.T.
DENBIGH 24in. B.G.
HERBERT "C" Power Feed.
CORONA No. 21 AR, No. 3 M.T.
JONES & SHIPMAN 816, $\frac{3}{16}$in. cap.
CORONA 1AX, No. 1 Morse Taper.
LELAND GIFFORD 2-sp., No. 2 M.T.
HERBERT Type B. Single Spindle, $\frac{1}{2}$in.
CORONA 6MX Cluster Type.
HERBERT Type H, $\frac{1}{2}$in. cap.
ENGRAVERS
T.T. & H. 3 dimensional.
ALEXANDER No. 2, 3-dimensional.
LIENHARD 3-dimensional. (New.)
LIENHARD No. 1H.
HUPFIELD Router.
T.T. & H. Type C, C.B. and M.A.
T.T. & H. Multi Etcher.
FILING AND SAWING MACHINES
JONES No. 13 Bandsaw.
WICKSTEAD No. 1 Hacksaw.
RAPIDOR 6in. Hacksaw.
RAPIDOR Filing.
FOLDERS
Sheet Edging, 30in. × 22g.
GEAR CUTTERS
SAFAG Pinion.
MAXICUT 7in. × 2in. × 6 D.P.
PETERMAN No. 1 and 2.
GRINDERS (Internal)
CHURCHILL HBY.
BRYANT 16/38 and 5.
GRINDERS (Surface)
CHURCHILL OSB 8in. × 30in.
LUMSDEN Vert. 210 XXM.
ABRASIVE No. 34 Vertical Spindle.
GRINDERS (Cylindrical)
CHURCHILL 6 × 36in. B.Y.
CHURCHILL PBH 12 × 36in. Univ.
NEWALL 6 × 18. Model XL.
GRINDERS (Miscellaneous)
BROWN & SHARPE No. 10 and 13 T. & C.
J. & S. "Perfect Point" 0·010in.-$\frac{1}{8}$in. Drill.
JONES & SHIPMAN, 10in. × 27in. T. & C.
J. & S. Drill, $\frac{1}{8}$in. to $\frac{3}{8}$in.
STEDALL WUNDERLI Carbide.
ROWLAND 12in. × 2in. Single Wheel.
WICKMAN NIVEN Carbide.
WADKIN Saw Sharpener.
JACKMAN D/E 18in. Disc.
EXCEL Model OS. T. & C.
TURNER 14/20 20in. × $3\frac{1}{2}$in. wheels C/E.
NEWALL 420 Univ. Threads.
HUNT No. 0 and 1 Tap Regrinders.
HUNT No. 0, 2 and 3 Drill.
CHURCHILL Valve.
HONER
DELAPENA 4-speed.
KEYSEATERS
BENTLEY 5in.
ASQUITH H.K.O. Horiz. Duplex.
EDGWICK 4in.
LATHES
DEAN, SMITH & GRACE 7in. S.S. & S.C.
CHURCHILL Cub, 6in. × 24in. S.S. & S.C.
SOUTHBEND 13in. S.S. & S.C.
DENHAM $4\frac{1}{2}$in. × 24in. S.S. & S.C.
LE BLOND Production, 11in.
RIVETT S.S. & S.C. 4in. Model 602.
SOUTHBEND 10in. Toolroom.
WILLSON $7\frac{1}{2}$in. × 36in. S.S. & S.C.
MONARCH 10EE × 22in. S.S. & S.C.
SMALLPIECE 9SW Multi-tool.
RIVETT $3\frac{1}{2}$in. Plain. Model 715.
WARD, HAGGAS & SMITH $8\frac{1}{2}$in. × 78in.
RYDERMATIC No. 12 Multi Tool.
BERRY $6\frac{1}{2}$in. × 36in. S.S.& S.C.
MISCELLANEOUS MACHINES
LUKE & SPENCER 38in. × 4 HP Polisher.
CANNING 54in. × 2 HP Polisher.
Dust Extractors, Various.
MILLERS (Horizontal)
DENBIGH C4. Table 46 × 10.
CINCINNATI O8 Production.
CINCINNATI 1/18 Production.
ROSCHER EICHLER. Table 39in. × 12 in.
ST. ANDREA Model UFO3 Table 57 × 14.
KENT OWEN 1/8 Production.
HARDINGE Precision. Table 25 × $6\frac{1}{2}$.
WERNER. Table 14 × 5.
JONES 225 Univ. Table 22 × 6.
ARCHDALE 20in. dial and 14in. mfg.
RICHMOND O3. Table 40 × 10.
U.S. Multi Mill.... Production.
MILLERS (Vertical)
REED PRENTICE No. 2.
BROWN & SHARPE No. 2 Light.
C.V.A. 79 Tool and Die.
REED PRENTICE No. 5, 68in. × 16in. table.
WADKIN Type LXIA. Table 36in. × 13in.
PRESSES (Power)
BESCO BA 20. Adj. Str.
BLISS No. 18. Adj. Str.
BLISS No. 16 Bar.
LECRA No. 8. 4 tons.
WRIGHT Clicking Press.
PROFILING MACHINE
CURDNUBE 2 Spindle. Model KIV.
RIVETERS
HIGH SPEED Hammer, 7/16 cap.
TURNER RH18 ($\frac{1}{8}$in.), RH38 ($\frac{3}{8}$in.), RH34 ($\frac{3}{4}$in.), RH14 and 14/12 ($\frac{1}{4}$in.).
SCREWING MACHINE
ATLAS No. 2, 3in.-6in. (Unused.)
SHAPERS
INVICTA 10in.
NEWEY 14in.
SHEET METAL MACHINES
BESCO 12in. and 16in. Treadle Guillotines.
FROST 6in. × $\frac{1}{8}$in. Power Guillotine.
BESCO 21in. × $1\frac{1}{2}$in. Rolls.
BESCO 48in. Power Guillotine.
SLOTTERS
EDGWICK.
TAPPERS
ESSEX No. 24, $\frac{1}{4}$in. cap.
ACE Horiz., $\frac{1}{4}$in. cap.
J. & S. Electrotap, $\frac{1}{4}$in.
THREAD MILLERS
WICKMAN MOULTON 1B.

SELECTED MACHINES

BECHLER CER 50 Single Spindle Automatic, Ser. 600516. 2in. bar cap, speeds up to 1,500 r.p.m. Complete range of tooling, collets and feed fingers. Vast quantity of new spares.

C.V.A. S.S. Automatic Ser. 31488, $\frac{1}{2}$in. cap., range of tooling, collets, etc., bar feed.

WANDERER Vertical Mill, Type 1FV. Ser. 5463. 1954. Swivel head, No. 50 I.T. 16 speeds—45 to 1,400 r.p.m. Table 39in. × 12in., Power feeds and rapid traverse all directions. Coolant. Late type machine.

PEGARD Auto Production Mill, speeds 22 to 1,128 r.p.m. Table w/S 30in. × $12\frac{1}{2}$in. Auto feed cycle. Kneeless with R and F head, retractable spindle, coolant. Late type machine.

RHODES No. 2 Double Side Inclinable Dieing Press. 45 tons, variable strokes per min. 10 to 450. Adjustable stroke $\frac{1}{4}$in. to $2\frac{1}{2}$in., roll feed and scrap shear.

All machines motorised 415/3/50.

A. LAWRENCE & CO., (MACHINE TOOLS) LTD.,
WELSH HARP, EDGWARE ROAD, LONDON, N.W.2.
Tel. GLA. 0033.

Broadbent 10ft. 0in. Vertical Boring and Turning Mill. Raised Column to give 88in. under Toolholder. New 1959 and in new condition.
Further details and full quotation from:
C. & G. OLDFIELD, LTD.,
15, Abercorn Street,
PAISLEY

Goss & deLeeuw 6 × $6\frac{1}{2}$ Tool Rotating 4-Spindle Automatic Chucking Machine. 400/3/50. Threading attachment.—HICKS MACHINERY, LTD., 26, Addison Place, London, W.11. Tel. PARk 2333.

35ft. Redman Planing Machine, Ward-Leonard AC/DC drive, complete with switchgear.—BOX D154, MACHINERY, Clifton House, Euston Road, N.W.1.

Colchester Student Colt Lathe, good condition with some equipment, £325. Corona 3 Spindle Drilling Machine, Motorised, £50.
J. HORNAL, LTD.,
238, Dawes Road, Fulham, S.W.6.
Telephone: Fulham 1051.

Brown & Sharpe No. 2 Auto with overheads, two Tool posts, some collets.—H. BYWATER, New Spring Street, Birmingham, 18. Cen. 5795.

HIGH QUALITY USED MACHINE TOOLS

Used **PRECIMAX** Type UPJ12/72 Hydraulic Universal Cylindrical Grinding Machine with variable speed workhead and electrics to suit 400/3/50.
Used **CINCINNATI** No. 2 Tool and Cutter Grinding Machine. 400/3/50.
HERBERT No. 12 Heavy Duty Combination Turret Lathe. Full chucking equipment. 400/3/50.
TOWN 28in. Vertical Spindle Drilling Machine. Compound table. 400/3/50.
K. & W. 33in. Sensitive Radial Drilling Machine. Swing-aside table, swing-aside arm. 400/3/50.
JONES & SHIPMAN 20in. Vertical Drilling Machine. No. 4 Morse Taper. Power feed. 400/3/50.
KEARNS No. 2 Standard Horizontal Boring Machine with facing head and sliding spindle. 400/3/50.
SNOW T20 Table Surface Grinding Machine.
ARCHDALE 28in. Horizontal Manufacturing Milling Machine, with power and rapid feeds. Table size 49in. × 30in. 400/3/50.

WE UNDERTAKE REBUILDING OF ALL TYPES OF MACHINE TOOLS

CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL,
BIRMINGHAM, 12.
Tel.: EDGbaston 1118 & 1119 'Grams: Capstan, Birmingham

RING BELLS *for machine tools*
LEEDS 63-7398

NEW MACHINE TOOLS
FOR QUICK DELIVERY

COLCHESTER LATHES

Kamenicek Universal Grinding Machines.

Kamenicek Internal Grinder.

Richmond Plain, Universal and Vertical Millers.

Zbrojovka Plain, Universal and Vertical Millers.

MITCHELL LATHES

Kamenicek Tool and Cutter Grinders.

Richmond Model S.R.2 and H.B.3 Radial Drilling Machines.

Vernier Millers.

Plauert Horizontal Boring Machines.

Please telephone or write for full details—

The Selson Machine Tool Co. Ltd.,
Sunbeam Road, London, N.W.10. *Telephone: Elgar 4000*

ROYAL BURGH OF IRVINE
INDUSTRIAL ESTATE
DISPOSAL OF HEATING INSTALLATION

The Town Council invite offers for all or any of the undernoted items comprising the Heating Installation at the Irvine Industrial Estate, which was formerly a Royal Ordnance Factory operated by the Ministry of Supply. The Installation, which is in good condition, was erected in 1938 and comprises:—

4 "Cochrane Kirke" Sinuflo Economic Boilers, each of 18,000 lb. steam per hour at 100 lbs. per square inch, with Bennis induced draught coking stokers: 1 Zeolite water softening plant and chemical dosing gear. 2 Feed Tanks. 2 Feed Pumps. 1 Instrument Panel (Main). 1 Coal Elevator and Conveyor. 1 Ash Elevator. 4 Overhead Coal Bunkers. 4 Steel Chimneys 3ft. 6in. diam. by 53ft. high. 4 Boiler Instrument Panels. 2 Feed Water Meters. 1 Emergency Battery Lighting Set.

One of the Boilers is in use and Insurance Reports are available for inspection. The plant may be inspected by arrangement with the Burgh Surveyor, Heathfield, Kilwinning Road, Irvine (Telephone: Irvine 2051), who will also provide full particulars of the plant. Offers marked "Heating Plant" should be lodged with the undersigned, not later than 2nd October, 1961. The highest or any offer may not be accepted.

ROBERT WHYTE,
Town Clerk.

Council Chambers,
IRVINE, 3rd August, 1961.

Small advertisements telephoned Wednesday, will be inserted the following Wednesday.

Warner & Swasey No. 1A Combination Turret Lathe, Serial No. 434730.

Further details from —
C & G. OLDFIELD, Ltd.,
15, Abercorn Street,
PAISLEY.
Member of B.A.M.T.M.

Kearns No. 1 Horizontal Boring and Facing Machine, complete with Rear Stay. A.C. Motor.

Further details from:—
C. & G. OLDFIELD, Ltd.
15, Abercorn Street,
PAISLEY.

No. 9A Herbert M/D All-gd. Combination Turret Lathe. Covered vee bed. Swings 20½in. dia. over bed. Roller bearing spindle bored 4½in. dia. Admits 60in. spindle to turret. 16 spindle speeds 21-809 r.p.m.—LEE & HUNT, Ltd., Crocus Street, Nottingham. 'Phone 84246.

Kitchen & Wade H5 Horizontal Boring and Drilling Machine, complete with Square Box Table and Auxiliary Revolving Table. Machine equal to new.

Further details from —
C. & G. OLDFIELD, Ltd.,
15, Abercorn Street,
PAISLEY

AUCTIONS

E R

By order of the SECRETARY OF STATE FOR WAR, Messrs.

FULLER HORSEY
Sons & Cassell

have been instructed to offer for SALE by AUCTION in Lots at the **ROYAL ARSENAL, WOOLWICH, LONDON, S.E.18,** on **TUESDAY, 29th AUGUST, 1961,** and the following days at 10.30 a.m. precisely each day

ENGINEERS' MACHINE TOOLS INDUSTRIAL EQUIPMENT AND SURPLUS STORES

including Cincinnati 3/24 PLAIN HYDROMATIC MILLING MACHINE; Kitchen & Wade motorised VERTICAL CYLINDRICAL HONING MACHINE; Thompson HYDRAULIC BROACH GRINDER; SURFACE, CYLINDRICAL, ROTARY and other GRINDERS; S.S. & S.C. LATHES; PLAIN, UNIVERSAL and VERTICAL MILLING MACHINES; VERTICAL DRILLING MACHINE; POWER PRESSES; 210 Petrol Electric CHARGING SETS; 39 Russell-Newbury 62.5 kVA DIESEL ELECTRIC GENERATING SETS; Petrol Electric Generating Sets; 8 Coventry Climax FORK LIFT TRUCKS; M.T. Spares; "Matbro-Mantis" Diesel Driven HEAVY DUTY HYDRAULIC EXCAVATOR; Aveling Barford Petrol ROAD ROLLER; CONCRETE MIXERS; 3 Barber, Greene TAR MACADAM PLANT DRYERS; 4,000 pairs BINOCULARS; 1,700 POCKET WATCHES; 500 WRISTLET and STOP WATCHES; 2,000 PRISMATIC COMPASSES; 400 SIGNALLING TELESCOPES; ELECTRIC CABLE; Electrical Stores; Scrap Radar and Wireless Equipment, RECEPTION SETS; COMMUNICATION RECEIVERS, 160 cases WIRELESS KIT EQUIPMENT; Portable Batteries; THEODOLITES, SURVEYORS' LEVELS; 3,000 Ammeters, Voltmeters and Wavemeters; Tool Kits; Small Tools, Service Clothing; Furniture and numerous other effects

Catalogues 1/- each admitting two persons on view days (Wednesday, Thursday, Friday and Monday preceding Sale) and one on Sale Days, **may be had, when ready, from the AUCTIONEER'S OFFICES,** Dept. 10, 10, Lloyds Avenue, London, E.C.3.

SITUATIONS VACANT

If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed, but you will not be notified as this would disclose the identity of the advertiser.

Maintenance Engineer Required by progressive smaller spring manufacturer to take complete control of machine-shop. Excellent salary and scope for the right man. State age, experience and salary. All applications will be treated in confidence.—BOX D155, Machinery, Clifton House, Euston Road, N.W.1.

LONDON TUBE MILL Require a man well experienced in the running of a Mild Steel tube mill. Extremely good prospects for promotion but he must at first be in the position to work shifts.

Apply **H.U.B. Ltd.,**
31 Park Crescent, Mews West, London, W.1.

Top Grade Sales Engineer

REQUIRED BY COMPANY EXPANDING THEIR RANGE OF HIGH GRADE SPECIALISED MACHINE TOOLS

A thorough engineering background, initiative and ability to deal expeditiously with correspondence are essential. Preference will be given to candidate with a knowledge of German and previous sales experience.

This is an interesting position for a young and energetic man, with good prospects leading to Technical Sales Manager.

Please write fully in strictest confidence to—

The Managing Director · Embassy Machine Tool Co. Ltd., 248, Watford Way, Hendon, London, N.W.4.

The Muihead Engineering Co.Ltd. is shortly moving into a new factory, and applications are invited for the following DRAWING OFFICE vacancies:—

1. SENIOR MACHINE TOOL DESIGNER Must be a man with established record in this field, preferably with experience of Rotary Transfer Machines and Unit Heads.
2. SENIOR AND JUNIOR JIG AND TOOL DRAUGHTSMEN for design and detailing of fixtures and Multi-Spindle Drill Heads.

Housing will be available in Hatfield for selected applicants.

Apply:

CHIEF DRAUGHTSMAN,
THE MULHEAD ENGINEERING CO. LTD.,
136-138 GREAT NORTH ROAD,
HATFIELD, HERTS.

R.R.E. COLLEGE OF ELECTRONICS
MINISTRY OF AVIATION
ROYAL RADAR ESTABLISHMENT
MALVERN

Grade B Assistant Lecturer required for January 1st, 1962, to teach Workshop Technology, Science Calculations and Drawing for C. & G. courses.

Applicants should be suitably qualified with at least a Higher National Certificate in Production or Mechanical Engineering, and have teaching and/or industrial experience.

Burnham Salary Scale, grade V, £700 × £27 10s.—£1,150, with appropriate allowances, up to £285, for suitable training and qualifications; subject to the Teachers' Superannuation Acts.

Further details and application forms from the Principal for return within two weeks of the appearance of this advertisement.

Special Purpose Machines and Equipment. Required by West London Precision Engineers, Senior and Improver Draughtsmen. Interesting Work. Good staff conditions with prospect of advancement and responsibility.—BOX D73, MACHINERY, Clifton House, Euston Road, N.W.1.

Works Manager Required For foundry in North West London. The essential requirements are age limit 30-40, a thorough knowledge of tool shop management and sound die casting foundry experience. This appointment provides scope for man with energy, drive and initiative.—Apply BOX D131, MACHINERY, Clifton House, Euston Road, N.W.1.

Highly Paid, Secure and Interest-ing posts are always available for technically trained men. Find out how you can put some letters after your name by preparing at home on "No Pass—No Fee" terms. A.M.I.Mech.E., A.M.I.Prod.E., A.M.S.E., City and Guilds, etc. Full details of exams. and hundreds of courses in all branches of Engineering. Draughtsmanship, Management and Automation Techniques, the benefits of our Employment Dept. and unique record of 95 per cent. successes are given in "Engineering Opportunities"—a valuable 148-page Guide which will reveal many chances you are now missing.—Write for your copy today (stating subject of interest).—FREE and without obligation. B.I.E.T. (Dept. 43a), 29, Wright's Lane, London, W.8.

SITUATIONS WANTED

Engineer, Age 29, Fifteen Years experience, in both the electrical and mechanical fields with regard to fitting, estimating, buying, and also sales experience, seeks change. Responsible position, prospects of promotion.—BOX D127, MACHINERY, Clifton House, Euston Road, N.W.1.

Works Manager, Extensive Ex-perience contract work, accustomed full command all production planning cost control departments, buying sub-contracting, liaison, seeks change. Resident mid-Essex.—BOX D157, MACHINERY, Clifton House, Euston Road, N.W.1.

Works Manager-Sales Manager, Chief Planner or Chief Draughtsman. Or any senior position. 30 years. Practical experience light and medium engineering. London and South of England only.—BOX D146, MACHINERY, Clifton House, Euston Road, N.W.1.

Sales Executive (34) Seeks Senior post, where background of PRODUCTION ENGINEERING, successful sales record, knowledge of machine tools, ability to organise, negotiate at all levels and speak fluent German, would be desirable qualifications.—Please reply BOX D148, MACHINERY, Clifton House, Euston Road, N.W.1.

RECEIVED TOO LATE FOR CLASSIFICATION

PLANT WANTED

MAAG GEAR GRINDERS

MODEL HSS. 10 and HSS. 30

Urgently required

Frye Machine Tool Co. LTD.,
POYLE ROAD, COLNBROOK,
SLOUGH, BUCKS.

Wanted, 8-10in. Centre Lathe, horizontal milling machine, surface grinder by a toolmaker wishing to start up his own shop. Reasonable offers please.—H. CLARIDGE, 14, Francis Road, Harrow Middlesex.

CONTRACT WORK

Immediate Capacity Available— 6ft. diam. Vertical Borer.
R. H. NEAL & CO., LTD.,
Grantham.

••• DESIGNS •••

Team of Mechanical and Struc-tural Draughtsmen require Designing, Drawing, Tracing work.—BOX D158, MACHINERY, Clifton House, Euston Road, N.W.1.

FOR "CLASSIFIED" ADVERTISEMENT RATES PLEASE SEE PAGE 127. SERIES RATES ON REQUEST.

INDEX TO ADVERTISERS

(Continued on page 160)

INDEX TO ADVERTISERS—*(continued from page 159)*

Published by THE MACHINERY PUBLISHING Co., LTD., at their Office, Clifton House, 83-117, Euston Rd., London, N.W.1. Telephone Euston 8441.
LONDON: HARRISON & SONS, LTD., by Appointment to Her Majesty The Queen, Printers, London, Hayes (Middx.) and High Wycombe.

m
31

lines)

n 8441.
vcombe.